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SUMMARY OF RECENT ABSTRACTS *

VII. HELMINTHIASIS †

TREMATODES

General

A Technical Report of WHO (p. 776) gives information on the extent of schistosomiasis in Africa and on the relevant snails. There is discussion on the controversial question of the importance of schistosomiasis to the infected populations, and on immunity. Animal reservoirs are said to be of minor importance in Africa, though rodents may have some influence. Irrigation operations are likely to cause spread. Sodium pentachlorophenate is the preferred molluscicide. A test of cure involves the absence of eggs at least 12 weeks after the conclusion of treatment.

Schistosomiasis is found, but is not common, in Israel; the local strain of *Bulinus* is not a good host for *S. haematobium*, and the snail hosts of *S. mansoni* are scarce; WITENBERG and SALITERNIK (p. 904) also point out that irrigation water in Israel is mainly carried in pipes, and is often pumped from deep wells and springs free from snails, so that the irrigation problem is not important, as it is in some other countries.

The schistosomiasis position in Liberia has not been well defined, and MILLER (p. 60) therefore made a survey in which he found *S. haematobium* infection rates of over 50% in the upper part of the Central Province. The coastal half was free, as was the entire Eastern Province and much of the Western Province. *S. mansoni* eggs were found in 0·3% of specimens of urine.

In the Niassa District of Portuguese East Africa DE MORAIS (p. 777) found vesical infection in 70·53% of children and intestinal infection in 5·78%.

In part of Mozambique FRAGA DE AZEVEDO *et al.* (p. 904) found *S. haematobium* in 64·4% and *S. mansoni* in 11·0% of 2,171 persons examined; more

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1958, v. 55. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

† For previous articles on helminthiasis in this series see the August and September issues of the *Tropical Diseases Bulletin* each year since 1939.

males were infected than females; enlargement of the liver was found in 33·5% and 41·7%, and of the spleen in 32·0% and 46·9% of the two infections respectively. Information is given on geographical distribution and on snail hosts.

WHO (p. 60) issued a technical report on the snail hosts of schistosomes, largely concerned with hydro-geological factors, but partly with control. Physical and chemical factors in snail ecology are discussed, and the natural enemies of the snails.

MANDAHL-BARTH (p. 664) has issued a classification of African *Bulinus* and *Biomphalaria*.

In reviewing the schistosomiasis situation in Africa ALVES (p. 174) comments on the frightening increase in the numbers of all snails in irrigated areas, and urges the importance of consultation with public health workers by engineers and others engaged in opening up the country.

In Ghana *Bulinus globosus* is the most important snail host of *S. haematobium*; *B. truncatus rohlfsi* can be infected in the laboratory but is sparsely distributed, though in one area it is the only potential vector. MCCULLOUGH (p. 176) found *B. forskali* widely distributed, but it has not yet been proved a vector in Ghana, and *Biomphalaria pfeifferi gaudi*, a known host of *S. mansoni*. Infection of man with *S. haematobium* is high in places, but *S. mansoni* is rare. The proposed Volta irrigation scheme may spread the disease.

In the Jadotville region of the Belgian Congo the snail hosts of the schistosomes of man are *Biomphalaria pfeifferi* and *Bulinus africanus*. LIETAR (p. 534) observed that the density of snails was markedly influenced by the alternation of dry and rainy seasons, and studied their developmental peculiarities and differences. Treatment of streams with sawdust impregnated with copper sulphate was useful, but sodium pentachlorophenate was effective only in slow streams with steep banks. Artificial flushing of streams was effective in destroying snails, and so was the use of fish. Half the African population are infected, about equally with *S. haematobium* and *S. mansoni*.

CRIDLAND (p. 536) studied the ecological factors affecting the numbers of snails in a permanent pond in Uganda, for details of which the original abstract should be consulted. He (p. 537) also studied them in a temporary body of water which dried up completely for up to 69 days in the year. Some snails (*e.g.*, uninfected *B. nasutus* and *Biomphalaria pfeifferi*) survived the drought, but it is unlikely that infected snails can do so. He (p. 539) also studied *Biomphalaria sudanica tanganyikana* in a permanent stream, in which density varied slightly with season, the rainy season (about April) being followed by an increase. The infection rate with *S. mansoni* varied considerably, being highest (4–16%) in December.

A monograph on the freshwater molluscs of South Save, Mozambique, has been published by FRAGA DE AZEVEDO *et al.* (p. 282), and deals with taxonomy and ecology.

FRAGA DE AZEVEDO *et al.* (p. 910) used radioactive phosphorus, iodine and copper to study the uptake of these substances by freshwater snails (*Helisoma duryi normale*).

PARAENSE (p. 1134) thinks that the planorbid genera *Australorbis, Tropicorbis, Biomphalaria, Platytaphius* and *Taphius* must be considered as synonymous, and should be united under the name *Taphius*.

MICHELSON (p. 545) sums up the literature on predators and parasites of

freshwater snails, concluding that the mammals, amphibians, reptiles and birds are least likely to provide fruitful study. The bacteria, viruses and fungi have hardly received attention hitherto.

The circumoval precipitin test is the best serological test available for diagnosis, but some sera from patients or animals with *S. haematobium* and *S. japonicum* give weak reactions against eggs of *S. mansoni,* and it is necessary to use live eggs, whose storage is not satisfactory; NEWSOME (p. 1024) reports experiments to overcome these difficulties.

GILLMAN (p. 540) discusses venous obstruction in the pathogenesis of schistosomiasis of the liver, noting that cirrhosis may be the end result of progressive obstruction of intrahepatic portal radicles induced by endophlebitis and periphlebitis due to eggs, or more especially dead worms, which stimulate much more vigorous reactions than eggs. In view of this it seems likely that an apparent cure of clinical signs and symptoms by killing the worms with drugs may be deceptive, leaving cirrhosis months or years later.

GELFAND (p. 417) in Southern Rhodesia reports 3 patients suffering from cor pulmonale with right heart failure and all with schistosomiasis. Only one of them at autopsy was found to have schistosomal tubercles in the lungs, and the cause of the cor pulmonale in the other two was not their schistosome infection. It is necessary to exercise caution before ascribing this condition to schistosomiasis, even in an endemic area.

In a study of parasitism and the nutritional state in Bantu children WALKER (p. 1343) notes that anaemia is uncommon, possibly because their iron intake is high.

PITCHFORD (p. 1345) treated children in the Eastern Transvaal suffering from schistosomiasis (*haematobium* or *mansoni*) with various drugs, but concludes that mass treatment is at present of doubtful value in the control of the disease there.

BLAIR (p. 1133) sums up published work on the treatment of schistosomiasis with lucanthone, drawing attention to the inconclusive nature of many of the trials, and suggesting that better results might be obtained if the total dose were given within 2 days, or even as a single massive dose, to obtain a sufficiently high concentration in the body fluids.

The xanthone derivatives (lucanthone, etc.) have only a narrow margin of safety; SANKALE *et al.* (p. 906) have tried a new preparation which had only slight side effects, but its therapeutic action was only moderate, and they suggest that it could be given between 2 courses of antimony.

Antimony dimercaptosuccinate (TWSb), which is a trivalent antimonial, has been used intravenously or intramuscularly in *S. haematobium* and a few *S. mansoni* infections, and gives a high cure rate; SALEM *et al.* (p. 664) note that it is easy to give, the course is short, it is relatively non-toxic, and the results are good. ALVES (p. 665) also gives a good account of it in a small series of urinary infections.

The diaminodiphenoxyalkanes are active against schistosomiasis in animals, but have a toxic action on the retina; GOODWIN *et al.* (p. 418) studied this and other toxic actions in laboratory animals.

LANOIX (p. 1242) discusses the relationship between irrigation engineering and schistosomiasis, commenting on the fact that the basic objective of the engineer and the hygienist is the same—the distribution of water—but that other factors are likely to intervene to prevent harmonious working. Research

and consultation are obviously needed [not only for the prevention of schistosomiasis].

Molluscicides

PAULINI (pp. 1244, 1248) discusses the use of molluscicides, pointing out that low concentrations applied for a long time are sometimes more effective and less expensive than high concentrations applied for a shorter time. Research for a cheaper and more effective molluscicide is needed. Adsorption appears to be the determining process in poisoning.

In experiments with dinitro-o-cyclohexylphenol, sodium pentachlorophenate and copper sulphate KUNTZ (p. 546) observed that maximum molluscicidal action on *Biomphalaria boissyi* occurred in the warmth of summer and in tubs artificially warmed.

DESCHIENS *et al.* (pp. 181, 182) experimentally found that granulated zinc in aquaria killed *Australorbis glabratus* and *Bulinus contortus* within 2–4 days, and affected water weeds but not goldfish. Zinc was found in solution up to a concentration of 2·2 mgm. per litre. Copper and brass had similar effects, which may be related to some electrical phenomena.

DESCHIENS *et al.* (p. 909) exposed *A. glabratus* and *B. truncatus* to various metals in solution and found that they had an enormous capacity for taking up copper ions, but less for iron, zinc and lead. The affinity for copper seems to account for the molluscicidal action of this metal.

FRAGA DE AZEVEDO *et al.* (p. 665) used radioactive copper in the study of the action of copper sulphate on snails; the copper diffuses through the various tissues and a general toxic action on protoplasm was observed.

In an investigation of the effect of copper sulphate on *Biomphalaria boissyi* EL-GINDY (p. 280) found that increase in temperature of the water directly increased toxicity, as did increase in concentration; cloudy flood water reduced toxicity. Infected snails were more severely affected than uninfected snails. There was some evidence to suggest that surviving treated snails developed a degree of resistance to subsequent exposure. He (p. 281) describes experiments which showed that the closed method, in which small canals with all outlets blocked are treated with copper sulphate to a concentration of 15–20 p.p.m., is very effective. The shore method in which copper sulphate is dragged through the shallow water at the sides of large feeder canals is less effective, especially on snails upstream. The continuous feeding method in which sacks of copper sulphate are immersed at the intake of a canal is effective, and there was especially a reduction in infected snails. *Bulinus truncatus* was more susceptible than *Biomphalaria boissyi* to copper sulphate.

In experiments on the effect of sodium pentachlorophenate on *Australorbis glabratus* KLOCK *et al.* (p. 285) found it completely lethal at 2 p.p.m. in the laboratory. Field experiments indicated that the distance of effective treatment from the point of application varied according to the amount of ponded water, and movement of water. The molluscicide could be applied as briquettes for pools, or as a spray, as well as in the solid state (though this was impracticable for flowing water). It can penetrate the shell of a snail and kill it.

WRIGHT *et al.* (p. 1245) observe that in Brazil sodium pentachlorophenate was found to be the best molluscicide. In streams it must be applied to ensure 10–20 p.p.m. for 8 hours or more, usually at intervals of about 1,000 feet. In an Egyptian canal system the molluscicide could be found as far as 22 km. from

the point of application, and satisfactory residual concentrations could be maintained for very long periods.

Sodium pentachlorophenate at 10–40 p.p.m. for 6–9 hours, or copper sulphate at 30 p.p.m. for 9 hours, killed all eggs of *A. glabratus* in the laboratory (CHAIA *et al.*, p. 1248).

PAULINI and PELLEGRINO (p. 1248) found that sodium pentachlorophenate in flowing water at a concentration of 60–160 p.p.m. killed 88·7% of snails infected with *S. mansoni* within 72 hours, but only 47·9% of uninfected snails.

PESSÕA and AMORIM (p. 547) used a mixture of pitch and BHC in kerosene as a molluscicide against *A. glabratus* in pools in Brazil, with some success. Copper carbonate was also useful in flowing water, and its action was improved by the addition of BHC.

Streptomycin inhibits growth and reproduction of *A. glabratus*; CHERNIN (p. 666) thinks that it acts directly, and its growth-inhibiting effects may be secondary to anorexia.

FRAGA DE AZEVEDO and GOMES (p. 547) tested 6 molluscicides in the laboratory on specimens of *Physa acuta* and *Helisoma duryi*, concluding that all had a generally toxic action.

S. haematobium infections

Schistosomiasis is widespread in Tanganyika but the incidence varies in different parts. MACLEAN *et al.* (p. 663) made a survey in the Usambara foothills and the plains below, and found *S. haematobium* eggs in 38·8% of urines from people of all ages, but the highest incidence (66%) was in boys aged 11–15. *S. mansoni* was rare. They state that disability due to schistosomiasis was difficult to assess. They discuss the snail hosts.

In a Bantu co-educational school in Durban FREEDMAN and ELSDON-DEW (p. 777) found *S. haematobium* in 46·8% of boys and 20·2% of girls; the boys, but not the girls, showed great increase with increasing age.

Schistosomiasis is rare in Basutoland though *Bulinus tropicus* was found in a survey by PITCHFORD (p. 1342); he found heavy infection with *S. haematobium* in children along a river in part of Bechuanaland.

PITCHFORD (p. 1343) refers to schistosome ova found in cattle, sheep and goats in Eastern Transvaal; they differ from those of *S. haematobium*, and are also found in rectal snips from children of the area. Identification studies are in progress.

VERDCOURT (p. 176) states that *Bulinus africanus ovoideus* has been shown to be a carrier of *S. haematobium* in Kenya, though attempts to infect it in Uganda were unsuccessful. He discusses the possibility that different strains exist.

MCCULLOUGH (p. 416) observes that in different parts of Ghana *S. haematobium* is transmitted by either *Bulinus* (*Bulinus*) *globosus* or *B.* (*Physopsis*) *truncatus*, but that each snail is refractory to the *S. haematobium* from the area infected by the other snail. There are therefore 2 strains of *S. haematobium* there, each highly specific for either the subgenus *Bulinus* or the subgenus *Physopsis*. This vector-parasite relationship is complex and needs further study throughout Africa.

MCCULLOUGH (p. 533) studied the density of *B. globosus* and *B. forskali* in various habitats in Ghana, at different periods of the year, and suggests that

for control 3 treatments with molluscicide should be given—in December, January and March or April.

LARIVIÈRE and CHARNIER (p. 1133) report a snail survey in Senegal (Cap Vert) in which *Bulinus forskali* was found.

S. haematobium is widespread in Angola, but *S. mansoni* is almost unknown; JANZ and DE CARVALHO (p. 532) conclude that the principal hosts are *Bulinus globosus* and *B. africanus,* with a very low infection rate in a snail identified by Wright as *B. crystallinus*.

DE MEILLON and HOLLINGHAM (p. 1344) carried out repeated complement-fixation tests on European children in South Africa after successful treatment for urinary schistosomiasis. They conclude that it cannot be used to assess cure 40 months after treatment unless the results have been consistently negative.

Schistosomal urethritis, orchi-epididymitis and spermatocystitis were found occasionally as complications of *S. haematobium* infection by HERVÉ *et al.* (p. 280).

NÉTIK and LETAC (p. 1241) report 2 cases in which death from acute uraemia was associated with eggs of schistosomes in the renal parenchyma. In one the eggs were of *S. haematobium*; in the other the species is not defined.

Early good results were found by VAN BEUKERING (p. 280) in a few patients with *S. haematobium* infection treated with Triostam; it is not known whether the long-term results were good.

SHAFEI (p. 541) tried a xanthone preparation similar to lucanthone on patients with *S. haematobium* infection; it had moderate therapeutic action, and side effects like those of other lucanthone preparations. The same author (p. 1346) used a new thioxanthone compound for *S. haematobium* infection. It has moderate schistosomicidal action *in vitro* but in high dosage side effects are prominent.

Desoxybenzoin does not radically affect *S. haematobium,* though it has some antiparasitic action *in vitro* and in experimental animals, but it reduces haematuria and other signs of infection, and CHIPPAUX and CORNET (p. 907) suggests that it can be given with advantage between repeated treatments with antimony.

Experiments carried out by DESCHIENS (p. 177) indicated that though *Bulinus truncatus* can maintain its population density in the dark, the absence of light is markedly deleterious to it. He argues in favour of covered drains and waterways in schistosomiasis control.

WATSON (p. 279) has investigated the effect of movement of water on *Bulinus truncatus*; wave action, rapid flow and floods are inimical, the last partly owing to the abrasive action of suspended mineral particles.

In describing a focus of *S. haematobium* infection in an irrigated area of Algeria MARILL (p. 1023) points out that it died out in one part when bathing in the canals was discontinued and the *Bulinus* disappeared. He mentions the importance of concrete canals, the application of molluscicides, and periodical drying of canal sectors; the snails were found to disappear every time a sector was dried for technical purposes.

S. mansoni infections

A symposium on schistosomiasis was held at the Naval Hospital, Salvador, Brazil (p. 417) at which most aspects of the disease were discussed.

S. mansoni has not hitherto been reported from Gambia though a potential snail host, *Biomphalaria pfeifferi gaudi*, exists there; SMITHERS (p. 542) now reports the infection in children in one village, and it may exist elsewhere.

BUTTNER and BOURCART (p. 174) point out the importance of the frequency of contact between man and snail in the epidemiology of schistosomiasis, citing an instance in Brazil where existing *Australorbis centimetralis* soon became infected when a labour force was introduced to clear an area of bush.

A survey of Puerto Rico children showed incidence of *S. mansoni* from nil to 29·3%, predominantly in males; WHITE *et al.* (p. 178) note that the incidence was related to the abundance of *A. glabratus*, and observed that though uninfected snails live for about a year, highly infected specimens survive for only about half a year. In flat country when the houses are sited away from rivers, snail infection is low, but in the mountain valleys the reverse is true.

OTTOLINA (p. 178) has published a long and valuable monograph on the miracidium of *S. mansoni*.

ROWAN (p. 544) describes a simple device for determining the population density of *S. mansoni* cercariae in infected waters.

PIMENTEL *et al.* (p. 63) studied the movements of marked *Australorbis glabratus* in a stream in Puerto Rico; they were restricted to about 20 feet for several weeks, but after that a general downstream movement took place. Flood waters may assist dissemination, and young snails or egg masses may be carried by birds, or even insects.

In a study of the ecology of *Australorbis glabratus* in Puerto Rico PIMENTEL and WHITE (p. 542) observed that large bodies of standing water were unsuitable for it, but small ponds and all types of running water and the associated marshes were very favourable. Drainage and irrigation canals were rarely infested because they were free from sewage.

ROWAN (p. 1134) describes a technique for mass cultivation of *Australorbis glabratus*.

CHERNIN (p. 543) describes a method for securing bacteriologically sterile *Australorbis glabratus*, for details of which the original abstract should be consulted.

PARAENSE and DESLANDES (p. 283) discuss *Australorbis nigricans* in São Paulo, Brazil, which can be differentiated from *A. glabratus* and which can be infected with *S. mansoni*.

BARBOSA and BARBOSA (p. 908) were able to infect 3 of 60 *Tropicorbis chilensis* in the laboratory with *S. mansoni*; it is not regarded as an efficient host.

In one set of experiments with mice COKER (p. 183) found that treatment with cortisone did not increase their susceptibility to *S. mansoni*.

BERG (p. 548) studied the effect of sexual hormones on *S. mansoni* in male mice, some of which were castrated and some of which received testosterone. He concludes that castration affected the development of male schistosomes only. The paper should be read in full.

MAGALHÃES and COELHO (p. 1349) describe the liver changes brought about by dead *S. mansoni* in mice; there was leucocyte infiltration followed by macrophage phagocytosis, and this in turn was followed by the appearance of fibroblasts and finally fibrosis with cicatricial contraction.

BRENER (p. 1249) reports on the distribution of eggs and granulomas in the tissues of mice infected with *S. mansoni*. Albino rats are highly resistant to

S. mansoni, and EVANS and STIREWALT (p. 910) found that their sera did not show any protein response to infection, whereas the sera of susceptible mice and hamsters exhibited marked rise in gamma and beta globulins.

VON SCHILLING and HENRÍQUEZ (p. 781) found natural infection with *S. mansoni* in the rabbit, in the form of granulomas in liver and bowel, and eggs in the contents of the colon. They discuss the possibility that the rabbit may be a reservoir.

FERGUSON *et al.* (p. 1347) describe a simple method for detecting *S. mansoni* eggs in faeces, which involves mixture with 5% KOH solution and centrifugation.

PRATA (p. 1135) has published a monograph on rectal biopsy in *S. mansoni* infection, which should be read in full; the original Portuguese text is supplemented by a long summary in English.

CHAFFEE and NIEVES (p. 64) observe that the complement-fixation test with an antigen of *S. mansoni* previously extracted with ether is not impaired by concomitant nematode infection, and only slightly in paragonimiasis.

In an assessment of the value of the intradermal test with an antigen prepared from adult *S. mansoni* PRATA *et al.* (p. 284) found it negative in 152 of 155 uninfected persons from a non-endemic area; of the 3 positive tests, 2 were in persons with hookworm infection.

DÍAZ-RIVERA *et al.* (p. 779) have analysed cases of *S. mansoni* infection, and comment that the earliest phase is mainly dominated by a hypersensitivity state of abrupt onset; the acute disease is usually mild, but there is an explosive form in heavily infected and poorly nourished persons who have defective body defences. The severity of the clinical picture is chiefly influenced by socio-economic factors and the adequacy of the defence mechanism.

RODRÍGUEZ-MOLINA (p. 1137) classifies the manifestations of *S. mansoni* infection into 3 categories: — asymptomatic, gastro-intestinal and visceral. The last is the least common, but may lead to cirrhosis of the liver.

DÍAZ-RIVERA *et al.* (p. 908) describe acute *S. mansoni* infection; the complete picture is most marked in hitherto uninfected persons, and the incubation period in their series was from 21 to 42 days. When severe symptoms occur they may be difficult to distinguish from typhoid fever and other febrile conditions. They used Fouadin in treatment, but it was not very satisfactory.

MARQUES (p. 1347) describes the acute stage of *S. mansoni* infection in 2 patients; they experienced severe itching and general urticaria after bathing in infested water, and later developed fever, diarrhoea, bloody sputum, vomiting and eosinophilia. The intradermal test became strongly positive. Antimony treatment was successful.

MARCHAND *et al.* (p. 780) describe the pulmonary obstruction syndrome in *S. mansoni* pulmonary endarteritis; there is severe respiratory distress, rapidly progressive, and cardiac decompensation which is soon fatal.

RODRÍGUEZ and RIVERA (p. 1137) describe 2 cases of pulmonary schistosomiasis (*S. mansoni*), one with pulmonary hypertension and death from acute cor pulmonale, and the other with severe haemoptysis in which surgical removal of the affected lobe was successful.

COUTINHO and LYRA (p. 179) discuss the splenomegaly of *S. mansoni* infection and the anaemia which accompanies it.

HASHEM (p. 905) states that Egyptian splenomegaly is especially common in Lower Egypt where *S. mansoni* infection is prevalent, but its direct relationship

with *S. mansoni* is still the subject of argument, though he accepts a causal relationship.

ARMBRUST (p. 180) records lesions in unusual sites in *S. mansoni* infection, and eggs in thyroid, spleen, lung, pancreas, lower oesophagus, stomach, duodenum, prostate and adrenals.

A schistosomal tumour due to *S. mansoni* in the dorsal spine, leading to paralysis, is described by HORRAX *et al.* (p. 180).

KLOETZEL (p. 1137) writes favourably of Miracil D in *S. mansoni* infections.

A drug of the diaminodiphenoxy alkane series is active against *S. mansoni*, but ASHTON (p. 65) shows that it has a severe toxic action on the eyes of cats.

Some success is claimed by PRATA (p. 181) for TWSb in *S. mansoni* infection.

GILLET *et al.* (p. 1024) tried stannous citrate for *S. mansoni* infection in man, but the results were very poor.

S. japonicum infections

Summing up modern work on schistosomiasis, MCMULLEN and HARRY (p. 1025) stress the importance of wild and domestic animals as reservoirs of *S. mansoni* and *S. japonicum*. In control even satisfactory disposal of human faeces is therefore not effective, and treatment of infected persons is unsatisfactory. Molluscicides give partial success, but must be applied time after time (3 times a year) or continuously. Other means of control such as varying the current of water, cementing the walls of water channels, converting them to tunnels, and introduction of natural enemies, are mentioned.

MAO (pp. 183, 911) reports the extensive work done on *S. japonicum* infection in China where the endemic area covers 11 provinces and where the reservoir hosts include domestic and wild animals—in some areas 91% of cattle are infected. The intradermal test was used, 58,000,000 being given in one year. Irrigation canals were treated by digging to bury the snails, after which they die in 3–6 months; calcium arsenite is an effective molluscicide. 2 new antimony compounds and ammonium antimony gluconate have been used in treatment, as well as tartar emetic; chloral hydrate reduces the toxicity of tartar emetic without affecting efficiency. The campaign against schistosomiasis is conceived on a gigantic scale.

For the first time HSÜ and LI (p. 418) in Formosa have incriminated the shrew *Crocidura murina* as a host of *S. japonicum*. They also found the infection in *Rattus rattus, R. norvegicus, R. losea* and *Mus formosanus* (for the first time).

HSÜ and HSÜ (p. 552) used the prepatent period in a definitive host, and the size and shape of eggs, in an attempt to differentiate strains of *S. japonicum* from 2 widely separated areas of Japan, but found no significant differences.

HSÜ and HSÜ (p. 1026) made measurements of eggs of Chinese, Formosan, Japanese and Philippine strains of *S. japonicum*, and found significant differences which indicate that although they may have originated from one ancestral stem, they have developed their own characteristics.

KUO and MAO (p. 184) observed variations in shell characteristics and the radular ribbon in specimens of *Oncomelania hupensis* collected from various provinces; the differences appeared to be taxonomically insignificant.

WAGNER and CHI (pp. 550, 551) studied the egg-laying of *Oncomelania nosophora* maintained on filter paper moistened with water, and observed that the process discontinued after a time, probably owing to the absence of soil,

and to an inadequate diet. They continued observations on reproduction in *O. quadrasi, O. nosophora* and *O. formosana,* for details of which the original abstract should be consulted.

SHAO *et al.* (p. 65) in an extensive experiment studied the infection rate in *Oncomelania hupensis* exposed to *S. japonicum,* which varied from 52% to 94%. They also studied the effect of variation in temperature on snail longevity and the output of cercariae, and observed that few survived desiccation for 40 days at 17·5°–24·5°C.

The pathological conditions found in 3 fatal cases of *S. japonicum* infection are recorded by DAO *et al.* (p. 782), and details should be sought in the original abstract. A feature was the absence of eosinophils from the peripheral blood, which usually indicates a grave prognosis. Overwhelming systemic intoxication with ultimate acute liver failure is the usual cause of death in fulminating schistosomiasis, and in these cases the toxic effect of antimonials on the heart and liver tends to be exaggerated.

Discussing *S. japonicum* infection in the Philippines PESIGAN *et al.* (pp. 1350, 1351) note that two-thirds of the infected persons have no clinical symptoms, and in those who have, the disease is mostly benign. Children aged 10–14 years suffer most, but later there seems to be some tolerance of the infection. Man is the chief source of infection, though dogs and cattle are also sources. *Oncomelania quadrasi* is the only known snail host, and an account is given of its biology. Infection has an adverse effect on it, and the infection rate, which shows annual periodicity, is greatest about 8 weeks after the heavy rains.

The clinical manifestations of acute *S. japonicum* infection are described by CHING (p. 781), who emphasizes the history of cercarial dermatitis, and the onset marked by fever, abdominal pain, diarrhoea and cough, and in some cases urticaria. There was often enlargement of liver and spleen, and sometimes physical signs in the lung; eosinophilia of 7–74% was usual, tending to diminish as the patients' condition deteriorated.

LIU *et al.* (p. 913) report that floods in China in 1954 were followed by a sharp increase in schistosomiasis, and they give an account of the acute disease. Cercarial dermatitis was common, fever was outstanding and respiratory symptoms common, but abdominal symptoms were not so frequently observed. Enlargement and tenderness of the liver were almost universal, and enlargement of the spleen was almost as common. Leucocytosis with marked eosinophilia was also common. Ectopic lesions, particularly in the lungs and occasionally in the brain, are not uncommon, and the general picture of the acute disease is protean; overwhelming infections are commonly fatal. Relapse after treatment is common.

SU and CH'EN (p. 1027) describe the clinical course of *S. japonicum* infection in children, which was fulminating, or acute, chronic or symptomless. Some of the patients had other diseases as well. Tartar emetic was the best form of treatment.

CH'EN and CH'EN (p. 67) discuss acute obstruction of the colon in *S. japonicum* infection, which was seen especially in subjects heavily infected for long periods. Malignant change was not uncommon. Prognosis is poor with palliative treatment alone, but better with successful resection.

S. japonicum infection may lead to radiologically visible changes in the lung, which, however, are not pathognomic; CHIANG and CHANG (p. 783) describe these as mottling or infiltration which may be fine or coarse (with large

patches), or increase in the lung markings with enlargement of hilar shadows. Specific treatment had little effect in resolving the lung shadows.

LIU *et al.* (p. 784) describe the pulmonary manifestations of *S. japonicum* infection, which they regard as part of the usual clinical manifestations of the acute stage. The symptoms and signs were usually mild; sputum was repeatedly negative for eggs. The most characteristic X-ray sign was the presence of miliary infiltrations along the vessels.

Cerebral schistosomal lesions are probably due to eggs in the brain, or to toxins, but CHANG *et al.* (p. 552) observe that no adult worms have been found in the brain, though eggs have been found. The clinical manifestations may develop weeks or years after infection, and the clinical course and pathology are described. Potassium antimony tartrate should be given promptly, and operation may be needed if there is papilloedema. Prognosis is generally good —no disabling sequelae follow prompt and thorough treatment.

In China potassium antimony tartrate has been used for *S. japonicum* infection in recent years, the gross dosage being 20–25 mgm. per kgm. divided into 20 intravenous injections (in 1% saline) given on consecutive days; LIU *et al.* (p. 785), however, are not satisfied with the results and suggest that the higher doses should be given for a longer time.

HUANG *et al.* (p. 786) discuss the cardiac arrhythmias which may follow treatment with potassium antimony tartrate, and which in their series included Adams-Stokes syndrome. They suggest large doses of atropine for emergency treatment.

CHU *et al.* (p. 787) investigated 32 compounds for possible use in *S. japonicum* infection; organic antimony compounds were active, and one (Sb-11) is receiving further study.

TSEN and TING (pp. 1028, 1029) found that rosaniline had some effect in experimental *S. japonicum* infection, and report on certain other drugs tried.

MAEGRAITH (p. 549) describes the schistosomiasis situation in China, where it is probably the most serious of the parasitic diseases, and the extensive measures which are being taken to control it, which include the use of molluscicides and of flame throwers for snails on the banks of streams. In winter mud containing the snails is removed from canals and ditches and is buried, or the ditches are filled in and new ditches dug.

MCMULLEN and HARRY (p. 1243) recall the point that for the control of *S. japonicum* infection, for which there are many reservoir hosts, education and sanitation may not be enough. Treatment of schistosomiasis in general is unsatisfactory except for *S. haematobium*. They discuss the use of molluscicides, which are often only temporarily effective, and they urge the use of all these methods, and of other forms of snail control, in campaigns against schistosomiasis.

Schistosome dermatitis

Schistosome dermatitis, possibly due to cercariae of the *ocellata* group, is reported by BONSEL *et al.* (p. 1250) from the Hague.

Dermatitis is common in rice workers of northern Italy; 2 forms are cercarial, and GIANOTTI and LUVONI (p. 1250) found several varieties of cercariae in snails of the genera *Limnaea* and *Physa*. The definitive hosts are aquatic birds and rats and mice. The snails may be found alive beneath the ice of irrigation canals in winter.

Stauber (p. 914) reports cercarial dermatitis from New Jersey, associated with the snails *Physa heterostropha* and *Nasserius obsoletus*.

Kagan and Meranze (p. 1251) describe the histopathology of experimental *Schistosomatium douthitti* infections in mice.

Paragonimus, Clonorchis and other trematode infections

Khoo Oon Teik (p. 286) describes several cases of paragonimiasis in Malaya, all probably acquired in Japan, and discusses the general subject of paragonimiasis in man and animals. Malayan snails could be infected by miracidia from eggs obtained from the sputum of these patients.

Taipei, the capital of Formosa, has not hitherto been an endemic focus of paragonimiasis, but in recent years people from the mainland have come to Formosa and have introduced the custom of eating "drunken crabs", live crabs in rice wine, sauce and spice. Huang and Chiu (p. 1252) found metacercariae of *Paragonimus westermani* in 16·6% of *Eriocheir japonicus*, and state that almost all the positive crabs could have been detected by examination of the gills alone.

Sakamoto (p. 667) found positive intradermal tests for *P. westermani* in 3·3% and 6·3% of two groups of Japanese schoolchildren in one area. Eggs were found in 15·9% of the sputum of a group with positive skin test, and in 4·2% of faeces.

Lei and Yen (p. 667) describe 5 fatal cases of paragonimiasis. All had eaten raw or partly cooked crayfish. Abdominal symptoms appeared first, then chest symptoms; later there were neurological symptoms. Much detail is given in the original abstract.

Diaconita *et al.* (p. 419) think (but without giving proof) that cerebral lesions are about as frequent as pulmonary lesions in paragonimiasis, and that for practical purposes they arise only with the pulmonary lesions by metastasis of the adult parasite or of eggs. They report 12 cases in Korea, but in comment Kershaw suggests that it is difficult to be certain that they had excluded *S. japonicum* infection.

Shih *et al.* (p. 1352) discuss paragonimiasis of the central nervous system for which diagnosis is based on (1) the occurrence of pulmonary paragonimiasis, together with a nervous syndrome, (2) abnormal cerebrospinal fluid, with eosinophilic pleocytosis, *Paragonimus* eggs and positive complement-fixation test, (3) abnormal radiological findings. Headache and epileptiform convulsions are common. Complete excision of the lesion is the treatment of choice. Spinal involvement is also described. The mechanism by which the parasite reaches the central nervous system is undecided.

Borowska-Kuzmicka *et al.* (p. 668) treated 2 patients with paragonimiasis with enemata of 200 cc. of 7·5% aqueous ethanol twice daily for 10 days; in one it seemed to have some effect. The other improved after a single intratracheal injection of 1·5 cc. of 1% emetine solution.

Experimental work in rabbits indicates that *C. sinensis* probably takes a route to the liver in which intestinal penetration and transfer by the portal system is a normal process, but Wykoff and Lepes (p. 554) do not rule out the possibility of migration directly from the duodenum into the common bile duct.

Kuwamura (p. 915) describes the course of experimental *Clonorchis sinensis* infection in the rabbit.

NISHIMOTO (p. 1251) gives an account of his surveys of infection of the snail *Parafossarulus manchouricus* with *Clonorchis sinensis* in part of Japan.

Infection with *Opisthorchis felineus* occurs in part of Russia; NOVAK and PILIPENKO (p. 1253) found hexachlorethane unsatisfactory in treatment, though commonly used. *Bithynia leachi* is infested with cercariae.

DESCHIENS (p. 668) discusses the incidence of *F. hepatica* in France, where it is more common than was formerly thought; he also discusses symptomatology and diagnosis.

BIAGI *et al.* (p. 1253) prepared an antigen from *Fasciola hepatica* for a precipitin test, and an intradermal test, for fascioliasis. The precipitin test may be positive before eggs are detected, and may be useful in epidemiological surveys. It did not give false positive reactions in the subjects tested.

A new distome has been recovered from subcutaneous cysts or abscesses in man in the Belgian Congo by FAIN and VANDEPITTE (pp. 68, 69), who describe it and name it *Poikilorchis congolensis,* n.g., n.sp. Its eggs are operculated and resemble those of *Paragonimus westermani.*

CESTODES

RAUSCH and WILLIAMSON (p. 788) describe from Alaska a new species, *Diphyllobothrium alascense,* which is probably a parasite of man.

SARAJAS and PÄTIÄLÄ (p. 916) show that eggs of *D. latum* lose their capacity to develop after exposure to temperatures below zero.

BRANTE and ERNBERG (p. 787) and NYBERG (p. 916) studied the mechanism of *Diphyllobothrium* anaemia by administering vitamin B12 labelled with cobalt 60.

DOBY *et al.* (p. 1138) discuss the incidence of *T. saginata* in the Yaoundé area of the French Cameroons. It is not high, but reaches 4·75% in rich Hausas who eat beef killed in slaughterhouses without sanitary control.

BIAGI and TAY (p. 917) used an antigen from cysticerci from pigs for a precipitin test on spinal fluid for the diagnosis of cysticercosis. The reaction was sensitive and did not give reactions with infections with other parasites.

GOODWIN and STANDEN (p. 420) used a treatment with piperazine hexahydrate followed next day with extract of male fern for taeniasis, and suggest that it may be an improvement on other treatments. They explain their technique of searching for the head of the worm in a blackened dish.

LASSANCE *et al.* (p. 788) write very favourably of Anthiphen, a derivative of dichlorophen, in the treatment of *Taenia saginata* infection.

COLLOMB *et al.* (p. 1255) describe cases of cerebral cysticercosis and report treatment with diethylcarbamazine in 3; this may have been beneficial.

Hydatid disease occurs in northern Norway, and REIN (p. 288) explains that the usual cycle is dog—reindeer. In man the disease is best demonstrated by compulsory chest X-ray. BAILENGER (pp. 189, 1353) discusses hydatid disease of the lungs, quoting figures from south-west France to show that it is not rare. CAPONE BRAGA (p. 554) thinks that there has been an increase in hydatid disease in Italy recently, and SUIC (p. 555) shows that the infection is widespread in dogs in Yugoslavia, with considerable human infection, especially in Dalmatia. WRAY (p. 669) reports that hydatid disease is fairly common in Kenya, where jackals and hyaenas may be hosts rather than dogs.

MEYERS (p. 70) describes a simple method for determining the viability of *Echinococcus* eggs; details are given in the original abstract.

Jezioranska and Dobrowolska (p. 188) prepared an antigen from hydatid cysts, and isolated various fractions from it. Complement-fixation tests with sera from normal and immunized rabbits showed specific fixation though there was some cross-fixation with certain nematode and cestode antigens. In persons suspected of hydatid disease some positive results were obtained.

Bensted and Atkinson (p. 1255) show that although the hydatid complement-fixation test is considered to be specific, the use of an antigen containing both host (usually sheep) protein and the specific hydatid fraction can confuse the issue in persons previously immunized with vaccines containing the same or related host protein—*e.g.*, rabies vaccine. This seems to be a temporary feature.

Hamman and Joubert (p. 422) discuss hydatid disease of the central nervous system, giving an account of symptomatology and diagnosis which should be read in full.

Vogel (p. 185) quotes experiments with dogs and field mice, in which the adult tapeworm stage of *Echinococcus* could be studied in detail, and which he considers prove that *Echinococcus multilocularis* is a true species distinct from *E. granulosus,* and he thinks that *E. sibiricensis* is a race or subspecies of *E. multilocularis.*

Echinococcus multilocularis has been found in foxes, microtine rodents, wolves and moose in North America; Sadun *et al.* (p. 187) show that various laboratory rodents can be infected and that the cotton rat particularly is a highly susceptible host suitable for laboratory investigation.

Rausch and Yamashita (p. 423) have found *E. multilocularis* in dogs in a Japanese island, and quote evidence which points strongly to the same infection in man there. Dogs, foxes and cats could be definitive hosts.

Charles Wilcocks

(*To be continued*)

MALARIA

In this section abstracts are arranged as far as possible in the following order:—Human malaria—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control;* Animal malaria—*monkeys, other animals, birds.*

NOTE

In the paper by M. Christie, *A Critical Review of the Role of the Immature Stages of Anopheline Mosquitoes in the Regulation of Adult Numbers, with Particular Reference to Anopheles gambiae* [this *Bulletin,* 1959, v. 56, 385–399], a comment is made on the work of Bates and De Zulueta, as follows:—

"It appears from their published data that fourth instar larvae only were identified, and that the specific composition of the total catch for the other instars was assumed to be the same as for the fourth instar. In other words they assumed that when a species was poorly represented by fourth stage larvae, it was equally poorly represented among the first stage larvae."

Mr. Christie writes to say that this is not an accurate interpretation of the work of Bates and De Zulueta, and that the second sentence should read:—

" In other words they assumed that when a species was poorly represented by fourth stage larvae, it was equally poorly represented by early stage larvae. This assumption was supported over part of the period of observation by identifications of the first stage larvae."

JUMINER, B. Note sur l'anophélisme en Tunisie. [**Anophelines of Tunisia**] *Arch. Inst. Pasteur de Tunis.* 1959, Mar., v. 36, No. 1, 37–42, 1 map. [22 refs.]

A map illustrates the distribution of 10 species of *Anopheles* in Tunisia. The *maculipennis* group is represented by *A. m. labranchiae* and *A. m. maculipennis*; *A. multicolor* and *A. hispaniola* are reported to be of importance in malaria transmission. *A. multicolor* is a desert species of the southern half of the territory, *A. hispaniola* in hilly regions mainly inland, and *A. m. labranchiae* commonly coastal but not exclusively so. Their distributions overlap in one southern area where *A. algeriensis* also occurs. This species is also thought to be a vector. The other species recorded, in limited areas, are *A. superpictus, A. dthali, A. sergenti, A. coustani, A. marteri* and *A. claviger*. Of these *A. sergenti* is noted as a local secondary vector of malaria. The paper confines itself to general statements on the role of species as vectors of malaria.

D. S. Bertram

HSU, Kuo-Chin, LEE, Jung, HUANG, Siu-Chen, TAI, Su-Yen, HU, Hsiao-Su, FENG, Shui-Yuan, HSU, Beh-Ru & WANG, Hsing-Chen. [**A Report on the Species and Ecology of Mosquitoes in Chengtu, Szechwan, China**] *Acta Entomologica Sinica.* 1959, Feb., v. 9, No. 1, 85–92, 1 chart. [18 refs.] [In Chinese.]

The English summary appended to the paper is as follows:—

" A survey on the species and ecology of mosquitoes in Chengtu, Szechwan, China, has been undertaken from 1954 to 1956. It was found that seven genera and 32 species of mosquitoes were present in this locality, namely *Anopheles hyrcanus* var. *sinensis, Anopheles pattoni, Anopheles barbirostris, Anopheles hyrcanus* var. *nigerrimus, Culex fatigans, Culex tritaeniorhynchus, Culex bitaeniorhynchus, Aëdes albopictus, Armigeres obturbans, Anopheles minimus, Anopheles kweiyangensis, Anopheles gigas baileyi, Culex vishnui, Culex vorax, Culex fuscanus, Culex pallidothorax, Culex malayi, Culex whitmorei, Culex vagans, Culex sinensis, Culex mimeticus, Culex mimulus, Culex orientalis, Culex hayashii, Aëdes alboscutellatus, Aëdes lineatopennis, Aëdes vexans, Aëdes annandalei, Aëdes mediopunctatus, Theobaldia niveitaeniata, Tripteroides bambusa* and *Mansonia uniformis*. The last named 23 species were recorded for the first time in this area and *Aëdes alboscutellatus* was recorded for the first time in China,

" It was found that *Culex fatigans, C. tritaeniorhynchus, Anopheles hyrcanus* var. *sinensis, Aëdes albopictus* and *Armigeres obturbans* were the most common species of mosquitoes in Chengtu area and their seasonal distribution was briefly as follows. The highest peak for *Culex fatigans* was in June and September and that for *Culex tritaeniorhynchus* was in June, June to July and July. The highest peak for *Anopheles hyrcanus* var. *sinensis* was in August, whereas that for *Aëdes albopictus* was in July, August and June. *Armigeres obturbans* attained highest density in September or October.

" Eighteen species were found in the human dwellings, among them *Culex fatigans* being very common. Eighteen species were also found in cow stables and *Culex tritaeniorhynchus* being the commonest. *Culex fatigans* was common species found in temples, empty houses and the walls under bridges.

" *Culex fatigans* was found to hibernate in the adult stage. They hibernated mainly under the bridges and in the empty houses. The ovaries from mosquitoes caught in January were not developed at all. The percentages of mature ovaries of mosquitoes caught in November and December were 8·2% and 1% respectively. In January and February no mature ovaries were found. The mosquitoes caught in December were found to have plenty of fat bodies.

" *Anopheles hyrcanus* var. *sinensis* was found to hibernate in the adult stage. They were numerous in the cow stables and may also be found in human dwellings and the caves in tombs. Their larvae can be collected throughout the winter, but those collected in the middle of December and the beginning of January could not hatch to adults in the laboratory.

" *Aëdes albopictus, Aëdes mediopunctatus* and *Tripteroides bambusa* were found to hibernate in the egg stage and the soil in the bamboo stump was found to contain many eggs of the first species."

Wu, Chia-Yung. [**A Preliminary Mosquito Survey in Chinping, Kweichow Province**] *Acta Entomologica Sinica.* 1959, Feb., v. 9, No. 1, 57–65, 3 figs. [26 refs.] [In Chinese.]

The English summary appended to the paper is as follows:—

" 1. The survey was made in Chinping, Kweichow Province during July and August 1956. Altogether 32 species were collected for the first time in this area, ten of them (with * mark) are newly recorded for Kweichow Province. They are listed as follows:

Anopheles aitkeni bengalensis
A. hyrcanus sinensis
A. kweiyangensis
A. lindesayi
A. maculatus
A. minimus
Tripteroides sp.*
Uranotaenia campestris zelena *
Orthopodomyia anopheloides maculata *
Aedes albolateralis *
Ae. hatorii *
Ae. albopictus
Ae. sp.*
Armigeres obturbans
Culex fuscanus
C. halifax
C. hayashii *
C. malayi *
C. nigropunctatus
C. pallidothorax
C. shebbearei
C. aurantapex *
C. bitaeniorhynchus
C. fatigans
C. mimeticus
C. mimulus
C. orientalis
C. sinensis
C. theileri
C. tritaeniorhynchus
C. vishnui
C. whitmorei *

" 2. The larval breeding places and adult catching stations of various species were described in detail.

" 3. On the basis of adult and larvae collections, 10 species are considered important in this district, namely: *A. hyrcanus sinensis, A. maculatus, A.*

minimus, Ar. obturbans, Ae. hatorii, Ae. albopictus, C. bitaeniorhynchus, C. fatigans, C. pallidothorax, C. vishnui.

" 4. The infestation of *A. hyrcanus sinensis* by a species of hydrachnid mite (water mite) was discussed in detail.

" 5. Observations of nocturnal activities of mosquitoes *A. hyrcanus sinensis, C. vishnui,* etc. were discussed."

LIU, En-Poo & CHEN, Chien-Shing. [**A Preliminary Report on the Study of the Hibernation of** *Anopheles hyrcanus* **var.** *sinensis* **in Chia-Hsing, Chekiang**] *Acta Entomologica Sinica.* 1959, Feb., v. 9, No. 1, 75–84, 3 figs. [17 refs.] [In Chinese.]

The English summary appended to the paper is as follows: —

" This is a preliminary report on the study of the hibernation of *A. hyrcanus* var. *sinensis* in Chia-Hsing District, Chekiang. The study was conducted from February–March, 1956 and from November, 1956 to April, 1957.

" The local adults *A. hyrcanus* var. *sinensis* are found to be able to hibernate from late November to the end of February the following year with a duration of about three months. Their winter hiding places were deserted forts, dens or pits. More than two weeks prior to and after hibernation, the adults were mostly found hiding in cattle sheds.

" The hibernation was not found in larval stage of *A. hyrcanus* var. *sinensis*. But a few larvae still can survive temporarily for a short period of freezing temperature. This proves their ability to withstand certain degree of low temperature.

" Morphologically, the eggs of *A. hyrcanus* var. *sinensis* laid prior to hibernation were apparently different from those laid in summer. Through laboratory culture they may metamorphose even after repeated freezing (duration more than 20 days). In eggs after hibernation for a period of 4–5 months, the percentage of metamorphosis was 76·2%. This proves the possibility of the hibernation of the eggs. This seems to be a new and rather important finding.

" What was formerly considered *A. hyrcanus* var. *sinensis* actually consists of two different types. The question of hibernation of eggs and adults of the two types is worth further studying."

LEWALLEN, L. L. **Paper Chromatography Studies of the** *Anopheles maculipennis* **Complex in California (Diptera: Culicidae).** *Ann. Entom. Soc. of America.* 1957, Nov., v. 50, No. 6, 602–6.

The following is virtually the author's summary: —

The adult characters of mosquitoes of the complex of *Anopheles maculipennis* Mg. in California have not been entirely satisfactory in distinguishing some populations of *Anopheles occidentalis* D. & K. from *A. freeborni* Aitken. " *A. occidentalis* is typically a coastal species with a coppery to silvery mark at the wing apex in populations from Pismo Beach northward, while populations from Pismo Beach southward often lack the wing mark or have an indistinct one, thus resembling *A. freeborni.*" Procedures for collecting and rearing these two species in the laboratory and methods of preparing chromatograms for comparison are discussed. " Comparisons of fresh-tissue, one dimensional, ascending chromatograms revealed that the ninhydrin-positive patterns formed

by protein constituents from the northern and southern *occidentalis* populations showed closer affinity to one another than either did to the *freeborni* pattern. The northern *occidentalis* chromatograms contained four or five ninhydrin-positive spots; the southern *occidentalis* contained three to five spots, while the *freeborni* chromatograms contained seven or eight spots.

"A difference in pattern was noted between male and female populations from the same locality, in most instances, as well as differences between sample populations of the same species from different areas. These differences did not affect the overall pattern for comparison of the two species.

"The preliminary results indicate that paper chromatography shows promise as another means of distinguishing between *occidentalis* populations and *freeborni* populations."

VARGAS, L. Nuevos datos sobre la distribución de anofelinos mexicanos. [**New Observations on the Distribution of Mexican Anophelines**] *Bol. Epidemiológico.* Mexico. 1958, Apr.–May–June, v. 22, No. 2, 33–53. English summary.

Anopheline mosquito records for 1,014 Mexican municipalities are brought together and listed under their respective states. 26 species or subspecies are given and records obtained for many previously unsurveyed rural areas. Attention is drawn to the finding of *Anopheles crucians,* and possibly *bradleyi,* on the Pacific coast, species previously recorded from the Atlantic coast in the United States and in New Mexico in the case of *A. crucians.* *E. R. Nye*

VELOSO, H. P. Considerações gerais sôbre os biótopos e habitats dos anofelíneos do sub-genero *Kerteszia.* [**Observations on Biotypes and Habitats of Anophelines of the Sub-Group** *Kerteszia*] *Mem. Inst. Oswaldo Cruz.* 1958, June, v. 56, No. 1, 163–79, 5 graphs. [13 refs.] English summary.

Between 1949 and 1953 surveys were made of anophelines (*Anopheles cruzii, A. bellator* and *A. homunculus*) breeding in bromeliads in several areas representative of different conditions in Brazil. Some 60,000 anopheline larvae were collected from 24,000 bromeliads out of 120,000 examined. Breeding occurred throughout the year with a peak of adults from January to February preceded by the period of greatest breeding (with some specific variation) between November and January. The bromeliad collection included 51 species with 24 varieties. A list names these and gives botanical notes and records of anopheline breeding, etc. for each and they are grouped into those which hold large (about 1,000 ml.) and small (up to 300 ml.) amounts of water.

In all areas *A. cruzii* was the common anopheline, breeding particularly successfully in large-capacity bromeliads. These are most numerous on the trees at heights over about 10 metres. This anopheline did, however, also breed to a limited extent in small-capacity bromeliads which not only formed over 92·5% of the bromeliad flora but tended to occur only from ground level to 5 metres. *A. bellator* also bred mainly in large-capacity plants about 10 metres and higher. *A. homunculus* was localized to small-capacity plants at 5 metres or lower. These data are illustrated graphically as well as discussed in the text.

The emphasis in this relationship of anophelines to bromeliads is on the water capacity of the bromeliads irrespective of their species, although, in practice, only 12 species seem important as breeding places for *A. cruzii*. It is suggested that a high degree of malaria control against *A. cruzii* can be expected by destruction of these large epiphytes at about 10 metres high or more, with special attention to lower, small-capacity bromeliads only in those local circumstances where they are found also to be breeding this vector in appreciable amounts. *D. S. Bertram*

MATHIS, W. & SCHOOF, H. F. **Organophosphorus Compounds as Residual Treatments for Adult Mosquito Control.** *Amer. J. Trop. Med. & Hyg.* 1959, Jan., v. 8, No. 1, 1–4.

After preliminary results to screen the potentialities of several insecticides, particularly organophosphorus compounds, as substitutes for or in conjunction with DDT and dieldrin, further experiments were made with malathion, parathion and EPN, which had been promising. The deposits were tested on the plywood panel walls of huts baited with rabbits, sited in a wooded area. The effects were noted against wild *Anopheles quadrimaculatus* and also known susceptible and dieldrin-resistant strains of this mosquito, these being allowed to enter the huts from a cage attached to a window or being released in the hut. Window traps were fitted to catch mosquitoes leaving the huts. The panels were treated before being fixed in the huts. Between tests they were removed and stored (bi-weekly).

The handling involved in this should be borne in mind in considering the results, although it is accepted that the residual action of malathion under normal domestic conditions must, of course, be determined.

Malathion produced 100% mortalities against dieldrin-resistant mosquitoes for the 4 to 5-month period of the tests in the following deposits: malathion at 100 and 200 mgm./sq. ft.; mixed with DDT at 1:2 or 2:1 ratio to give 300 mgm. insecticide/sq. ft.; mixed with dieldrin at 4:1 or 2:1 to give 125 or 150 mgm. insecticide/sq. ft. Kills with DDT alone (at 200 mgm./sq. ft.) and dieldrin alone (at 25 or 50 mgm./sq. ft.) after the same interval were, respectively, 54% and 46%. Parathion alone, and with DDT, gave results similar to those with malathion. EPN with DDT was rather less effective (84% mortality after 4 months). *D. S. Bertram*

GAHAN, J. B. & LABRECQUE, G. C. **Residual Effectiveness of Three Chrysanthemumates and Two Organophosphorus Compounds against Mosquitoes.** *Mosquito News.* 1959, Mar., v. 19, No. 1, 19–20.

A laboratory strain of non-resistant *Anopheles quadrimaculatus* was used to test the insecticides at deposits of 100 mgm. per square foot, DDT being used as a standard for comparison. The mosquitoes were confined against the treated surfaces in half Petri dishes for 5 to 120 minutes. DDT still gave 100% mortality after 90 days if exposure to contact under the Petri dish was at least 60 minutes. None of the other substances was effective by this time, but 2,4-dimethylbenzyl chrysanthemumate gave 63% to 100% mortalities after 15 and 120 minute exposures at 60 days. The other two compounds of this series and one of the organophosphorus compounds were not effective beyond 30

days. The second organophosphorus substance (Guthion) hardly killed any mosquitoes the day after application of the insecticide.

[For a previous study by these authors, see this *Bulletin*, 1958, v. 55, 1303.]

D. S. Bertram

LEWALLEN, L. L. **Toxicity of Several Organophosphorus Insecticides to *Gambusia affinis* (Baird and Girard) in Laboratory Tests.** *Mosquito News.* 1959, Mar., v. 19, No. 1, 1–2.

Chemical control of mosquito breeding by insecticide applications is sometimes desirable to supplement control by the predations of *Gambusia*. The effect of several organophosphorus insecticides on these fish was studied in laboratory tests. Malathion and parathion gave, respectively, 40% and 33% mortality of *Gambusia* at 0·05 and 0·004 p.p.m. in 24-hour exposures. Higher mortalities resulted with Thimet and Guthion [this *Bulletin*, 1958, v. 55, 949] and low or no mortality with 6 other compounds. *D. S. Bertram*

GÖKBERK, C. Ensektisitlere rezistans ve Türkiye anofellerinde yapilan rezistans testleri. [**Resistance to Insecticides and Test Results of Anophelines in Turkey**] *Türk Ijiyen ve Tecrübî Biyoloji Dergisi.* Ankara. 1958, v. 18, Nos. 2/3, 282–93, 2 charts. [30 refs.]

The English summary appended to the paper is as follows:—

" A detailed knowledge about the resistance of insects to the insecticides has been given with the results of the tests of Turkey's Anophelines. As the malaria cases were increasing in 1957, Dr. J. de Zulueta from WHO had a short visit to Turkey to test the Anophelines. He found out that there was a high resistance of An. sacharovi to DDT in Adana region and a high tolerance of An. maculipennis complex to DDT in Antalya and Balikesir regions. The anophelines were sensitive to both Dieldrin and Organophosphorus.

" Then, the resistance tests have been carried out by the present Author in different regions in Turkey. The results show that the resistance of An. sacharovi and An. maculipennis melonoon have been limited in the area shown in the map. In the other regions An. maculipennis messeae, An. maculipennis typicus, An. superpictus and An. bifurcatus have been found to be sensitive to DDT and Dieldrin except in Maras region where An. sacharovi had a tolerance (LC 50 = 1·75) to DDT.

" All of the tests, using WHO modified test kit, were made by the exposure of Anophelines to the insecticides 24, 8 and 1 hours. The results were taken 24 hours later. Busvine-Nash method was, sometimes, used to compare the results. It was clear that consistent results were obtained if only one mosquito was placed into each Busvine tube."

RAMAKRISHNA, V. & ELLIOTT, R. **Insecticide Resistance in *Anopheles gambiae* in Sokoto Province.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1959, Jan., v. 53, No. 1, 102–9, 1 map & 2 figs.

Dieldrin-resistant *Anopheles gambiae* in N. Nigeria were first reported in 1956 [ELLIOTT and RAMAKRISHNA, this *Bulletin*, 1956, v. 53, 857] and subsequently the strain was colonized in London and its toxicology and genetics

investigated by DAVIDSON [*ibid.*, 1958, v. 55, 1078]. Using the Busvine-Nash test for adult mosquitoes at the critical levels suggested by Davidson, ARMSTRONG *et al.* (1956) worked out the proportions of homozygous resistant, heterozygotes and susceptible individuals in different parts of the sprayed zone (WHO/Mal/182: a mimeographed report). The present authors have repeated this type of survey using larval mosquitoes and Elliott's technique [*ibid.*, 1959, v. 56, 418]. They show how the resistance levels vary considerably in different villages in the area, the degree of resistance to gamma BHC being generally consistent with the spraying history of each place. Gamma BHC induces particularly stringent selection, and where it had been used for $2\frac{1}{2}$ years the mosquito population appeared to be homozygous for dieldrin-BHC resistance and also to possess an additional minor factor specific for BHC.

In the town of Sokoto, 14 miles beyond the sprayed area, there was evidence of a marked increase in resistant individuals, presumably an extension of the resistant population beyond the treated zone.

There was no sign of cross resistance to DDT. *J. R. Busvine*

SHARMA, M. I. D., KRISHNAMURTHY, B. S. & SINGH, N. N. **Biometric Studies on the Susceptibility of some Species of Anopheline Mosquitoes to Technical D.D.T., Gamma B.H.C. and Technical Dieldrin.** *Indian J. Malariology*. 1957, Dec., v. 11, No. 4, 401–14.

Susceptibility tests have been carried out on four species of *Anopheles*: *culicifacies, fluviatilis, annularis* and *subpictus,* against technical DDT, gamma BHC and technical dieldrin in the regions of Uttar Pradesh, Rajasthan and Delhi. Details of the experiments and technique are given. The results of the investigations have been analysed by the probit analysis method. The importance of the regression coefficient is discussed and values of different parameters are produced to be used as base line data for comparison by other workers engaged in similar research. *V. D. Nguy*

JACKSON, G. J. **Simultaneous Infections with *Plasmodium berghei* and *Trypanosoma lewisi* in the Rat.** [Research Notes.] *J. Parasitology*. 1959, Feb., v. 45, No. 1, 94.

33 female Holtzman rats were inoculated with citrated blood containing "large numbers" of *Plasmodium berghei* and *Trypanosoma lewisi*. Daily stained blood films from tail veins showed that 25 became infected with both parasites and only 8 with *T. lewisi*. Simultaneous infection did not significantly alter the course of either and the parasitaemias were comparable to those of single infections.

Although single infections with either parasite are not usually fatal 17 of the 25 doubly infected rats died; this is ascribed to the very severe anaemia, in which mature erythrocytes and reticulocytes were so depleted that nucleated precursors appeared in the peripheral blood. Although *P. berghei* preferentially invades reticulocytes, it can also parasitize mature erythrocytes and nucleated precursors. *H. J. O'D. Burke-Gaffney*

Cox, H. W. **The Roles of Time and Atabrine in inducing Chronic *Plasmodium berghei* Infections of White Mice.** *J. Immunology.* 1958, July, v. 81, No. 1, 72–5.

90 Swiss mice (10–12 weeks old) were inoculated with *Plasmodium berghei.* Atabrine [mepacrine] (0·5 mgm.) was injected 4, 6, 8, 10, 12, 14, 16 and 18 days later in groups of 10 mice, leaving one group as an untreated control. The latter all died within 27 days. There were 20 survivors among the treated groups and these were challenged 45 days after the original inoculation with another dose of parasites; 18 were still alive 6 weeks after reinoculation, though a chronic infection had developed in a few.

In a second experiment, atabrine (0·5 mgm.) was given daily for 5 days to groups of mice 1–9 days after infection. In this experiment more chronic infections developed and 53 out of 85 mice survived for two months, when they were challenged with another dose. 8 died.

These experiments suggest that if a mouse is able to withstand (by dry treatment) the first wave of parasitaemia, it will develop an immunity and respond just as the rat does to this infection. *P. C. C. Garnham*

Fabiani, G., Orfila, Jeanne & Bonhoure, G. Influence de la splénectomie sur la résistance naturelle du Rat blanc à *Plasmodium vinckei.* [**Influence of Splenectomy on Natural Resistance of the White Rat to *Plasmodium vinckei***] *C.R. Soc. Biol.* 1958, v. 152, No. 2, 337–9.

35 adult rats were splenectomized and 19 of these were infected with *Plasmodium vinckei* up to 4 days later, 7 a week later and 9 six to eight weeks later. 34 of these animals developed a heavy infection and 27 died, while only one became cured. The pre-patent period was variable, lasting up to 20 days, which is longer than in intact animals, and was followed by a feeble parasitaemia which suddenly fulminated to kill the host. The death rate was highest in the group infected most recently after being splenectomized; in the two later groups, half the animals survived. Previous work of the authors [this *Bulletin,* 1959, v. 56, 595] had shown that splenectomy performed *after* infection produced less severe effects. *P. C. C. Garnham*

Huff, C. G., Marchbank, Dorothy F. & Shiroishi, T. **Changes in Infectiousness of Malarial Gametocytes. II. Analysis of the possible Causative Factors.** *Exper. Parasit.* New York. 1958, July, v. 7, No. 4, 399–417, 5 figs. [15 refs.]

Factors influencing the infectiousness of gametocytes of avian malaria parasites were analysed, the following index (I) being used as a basic guide: the mean number of oöcysts (as seen on the sixth day of infection) in a batch of mosquitoes, divided by the number of gametocytes per unit of erythrocytes at the time of the infective feed.

Two hypotheses to explain the gradual diminution of infectiousness during the course of the infection were tested: (1) a depletion of vital food stuffs and (2) the inimical influence of humoral immunity. Little evidence was found in support of the former, the addition of supplements such as uninfected whole blood, coenzyme A, ferrous sulphate, sodium glutathione, calcium pantothenate and sucrose did not enhance Index I; the effect of bleeding or of

superinfection was negligible. All the evidence tended to support the idea that immunity was the important factor; transfusion of blood containing *Plasmodium gallinaceum* to new chicks resulted in an increase in the value of I; a similar result was obtained in the (normally resistant) duck, but the attempt at passive transfer of immunity (with hyperimmune serum) had little influence on the I value in the new birds. The most striking demonstration of the sterilizing effect of immunity was obtained by immunizing birds with killed parasites (*P. gallinaceum* and *P. fallax*) and subsequently infecting them with living parasites, when a rapid fall in infectivity took place—this was not due to any lowering of parasitaemia in the "immunized" birds. It is interesting to note that this decline in infectiousness occurs long before the normal processes of immunity have influenced the course of the asexual infection.

Merozoite counts were made in *P. gallinaceum* schizonts in birds on pantothenate-deficient and on adequate diets: a significant difference, 12 and 17 respectively, was observed.

[For Part I, see this *Bulletin*, 1955, v. 52, 1172.] *P. C. C. Garnham*

Okpala, I. **Transmission of** *Plasmodium gallinaceum* **through** *Aedes stokesi*. *West African Med. J.* 1958, Dec., v. 7 (n.s.), No. 4, 195–6. [10 refs.]

The susceptibility of Nigerian forest mosquitoes to infection with *Plasmodium gallinaceum* was tested. The death rate of these species of mosquitoes was high and the ultimate number available for dissection was small, but 2 out of 3 *Aëdes stokesi* showed oöcysts, and 5 out of 7 showed sporozoites. For comparison, the infectivity of *Aëdes aegypti* was studied and was found to be 76% (oöcysts) and 69% (sporozoites), while *Culex fatigans* (190) completely failed to become infected in either gut or glands. *P. C. C. Garnham*

Yao, Dan-Fan & Tang, Ju-Yü. [**The Antimalarial Activity of Dichlorophenyltriazine and other Halogen Substituted Derivatives**] *Acta Pharmaceutica Sinica*. 1959, Mar., v. 7, No. 2, 84–9. [In Chinese.]

The English summary appended to the paper is as follows:—

"Chlorophenyltriazine is the active metabolite of chloroguanide in human body as well in animals. In our previous study it was found that chlorophenyltriazine was highly active against *P. gallinaceum*. The present study was to estimate the antimalarial activity of dichlorophenyltriazine (2:4 Diamino-1(3:4-dichlorophenyl)-6:6 dimethyl-1:6 dihydro-1:3:5-(triazine)) and some other halogen substituted derivatives, such as iodophenyltriazine (2:4 Diamino-1-p-iodophenyl-6:6 dimethyl-1:6 dihydro-1:3:5 triazine), bromophenyltriazine(2:4 Diamino-1-p-bromophenyl-6:6 dimethyl-1:6 dihydro-1:3:5 triazine) and fluorophenyl-triazine (2:4 Diamino-1-p-fluorophenyl-6:6 dimethyl 1:6 dihydro-1:3:5 triazine).

"All the compounds examined exhibited marked effect against *P. gallinaceum* in chicks. Their action not only reflected on the decrease in number of plasmodia, but also the morphological changes of the parasites. They were powerful schizontocide by attacking every stage of schizonts, although less effective on gametocytes. In addition, the toxicity of these drugs in mice by oral administration was very low.

" Table 1. The antimalarial potency and toxicity of the drugs

Drug	M. E. D. in chicks mg/kg	Quinine equivalent	Chloro-guanide equivalent	LD_{50} in mice mg/kg
Dichloro-phenyltriazine	0·1	200	100	295
Chloro-phenyltriazine	1	20	10	310
Iodo-phenyltriazine	0·5	40	20	638
Bromo-phenyltriazine	1	20	10	750
Fluoro-phenyltriazine	3	6·7	3·2	405

" Among the series of phenyltriazine compounds, dichlorophenyltriazine was the strongest antimalarial. However, iodophenyltriazine was more effective than all other monohalogen homologues, including chlorophenyltriazine. It is anticipated that diiodo-substitution in positions 3 and 4 of the benzine ring may yield a compound more potent than dichlorophenyltriazine.

" Pretreatment with dichlorophenyltriazine apparently suppressed the erythrocytic development of the parasites, since in the majority of chicks no parasites were observed in their peripheral blood. Nevertheless, it seemed too early to conclude that the drug had causal prophylactic effect. When dichlorophenyltriazine was repeatedly used for three successive courses of therapy, no drug resistance was produced in *P. gallinaceum* in chicks.

" Since more effective derivatives are now available, it seems advantageous to abandon the use of the parent substance and employ the new synthetic drugs."

HUFF, C. G., MARCHBANK, Dorothy F. & SHIROISHI, T. **Susceptibility and Resistance of Avian and Mosquito Hosts to Strains of *Plasmodium relictum* isolated from Pigeons.** *J. Protozoology*. Utica. 1959, Feb., v. 6, No. 1, 46–51, 1 fig. [15 refs.]

A useful history of strains of *Plasmodium relictum* isolated in pigeons in the U.S.A. is given, and their characters are summarized. Experiments were carried out on 2 strains, the earlier (*1P*) was derived from a natural infection in a Nebraska pigeon, the later (*1B*) in an Iowa pigeon.

Strain *1P* produced sporozoites in mosquitoes, but attempts to infect pigeons from these succeeded only 8 times in 72 trials; moreover pigeons themselves were found to be unsuitable hosts for infecting the mosquitoes (*Culex pipiens*) and the foregoing infections were obtained by feeding on canaries. If, however, *C. tarsalis* were allowed to feed on pigeons, up to 84% of the mosquitoes became infected.

Strain *1B* gave rise to low infections in pigeons if derived from sporozoites; *C. tarsalis* again proved to be the better host (half the mosquitoes becoming infected), but with this strain, 6% *C. pipiens* developed low infections when fed on either pigeons or canaries carrying the parasite.

These varying effects are illustrated in a schema showing the distribution curve of susceptibility of the two species of birds and of mosquitoes.

P. C. C. Garnham

TRYPANOSOMIASIS

In this section abstracts are arranged as far as possible in the following order:—African—*human, animal;* American—*Chagas's disease and other trypanosome infections. In each form the following order is followed*:—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.*

NIEMEGEERS, K. Durée de survie de *Trypanosoma gambiense* et de *Trypanosoma rhodesiense* dans le sang conservé destiné à des transfusions sanguines. [**Survival Time of** *Trypanosoma gambiense* **and** *T. rhodesiense* **in Blood preserved for Transfusion**] *Ann. Soc. Belge de Méd. Trop.* 1958, Aug. 31, v. 38, No. 4, 697–719. [Numerous refs.]

In view of the danger of transmitting sleeping sickness in the course of transfusion of blood from donors in the Belgian Congo and Ruanda Urundi harbouring undetected trypanosomes, the author has carried out experiments to determine the viability of *Trypanosoma gambiense* and *T. rhodesiense* in preserved blood. In the case of the former species, 8 guineapigs infected with 3 strains and 5 patients served as donors; in the case of the latter, 9 guineapigs infected with 3 strains. The blood collected from these sources was preserved in test-tubes in " A-C-D solution B " of the Cutter Laboratories at +3°C., and the tubes were examined at various intervals for the presence and viability of trypanosomes by the following methods: (a) blood culture, (b) thick blood film, (c) fresh preparations, and (d) inoculation of guineapigs (*T. gambiense*) or mice (*T. rhodesiense*): these animals were examined daily for 3 months.

It was found that motility of the trypanosomes of both species in preserved blood diminished progressively up to 10 days and they lost their power to grow in culture, but their infectivity for rodents was lost after preservation for 3 days. It is concluded that in endemic areas of sleeping sickness the risk of infection can be avoided by preserving the blood for at least 3 days before being used for transfusion. *C. A. Hoare*

FOSTER, R. **Laboratory Colonies of the Tsetse Fly** *Glossina morsitans. Bureau Permanent Interafricain de la Tsé-Tsé et de la Trypanosomiase No. 217/0*, Leopoldville (Congo Belge). Misc. Rep. No. 214. 1958, Dec.. 7 mimeographed pp.

Following his earlier attempts to maintain *Glossina morsitans* in the laboratory [this *Bulletin,* 1958, v. 55, 487] the author describes the results obtained with colonies kept under constant temperature conditions and compares them with earlier work where the flies were kept at room temperature. 4 colonies are compared: Colony 1 was kept at room temperature (73–80°F.); Colony 2 was maintained for 15 weeks only at 77–79°F.; Colonies 3 and 4 were maintained at a constant temperature of 79°F. in electrically-controlled incubators, but Colony 3 was offered food every third day while Colony 4 was fed every second day, the temperature being kept at 81°F. during feeding. Colony 1 was fed every fourth day. Sheep were mainly used as the blood meal source. The results from these experiments are summarized in tabular form.

G. morsitans; Comparative Data

	Colony 1	*Colony* 2*	*Colony* 3	*Colony* 4
1. No. of male flies	259	234	155	169
2. No. of female flies	280	335	162	177
Longevity				
3. Mean life of males (days)	41·0	(30·7)	67·8	85·4
4. Mean life of females (days)	60·8	(48·3)	87·6	90·0
Fecundity				
5. Proportion of females living to reproductive age	41%	(59%)	84%	92%
6. Proportion of females producing pupae	27%	(38%)	62%	70%
7. Proportion of females of reproductive age producing pupae	65%	(64%)	74%	76%
8. Mean no. of pupae per female	1·25	(1·20)	2·15	2·38
9. Mean no. of pupae per female of reproductive age	3·30	(2·00)	2·56	2·59
10. Mean no. of pupae per "producing female"	4·65	(3·20)	3·48	3·40
11. Mean interlarval period (days)	17·1	–	17·2	16·6

* Pilot Colony maintained for 15 weeks only.

It was also noted that there was less disparity in the death rates of male and female flies in Colony 4, the mean life of females being only about 5% greater than that of males.

The greater number of pupae per "producing female" in Colony 1 is noted but the author is unable to explain this unexpected result. *E. R. Nye*

HOCKING, K. S. **Discriminative Insecticide Spraying against** *G. morsitans*. **Preliminary Report.** *Bureau Permanent Interafricain de la Tsé-Tsé et de la Trypanosomiase No. 218/0,* Leopoldville (Congo Belge). [? 1959], 5 mimeographed pp., 1 folding map.

In an experimental control programme against *Glossina morsitans* spraying of resting places of the fly was carried out in a 17 square mile forested area of the Kabiganda Valley, South Western Uganda. The fly concentration sites consisted of groups of *Acacia hebecladoides,* associated with thickets, and spraying of the lower sides of the branches of the *Acucia* was done with a 3% (w/v) emulsion of dieldrin, giving a concentration of 0·8 gm./square metre of sprayed surface. Analysis of sprayed bark at intervals showed that 90% of the insecticide had disappeared after 4 months and 100% after 8 months. 10% of the original deposit was considered as still providing a lethal concentration.

For assessing the results of the programme the forest area was divided into 6 pairs of transect fly rounds, each enclosing a rectangular area of about 2 square miles. Weekly fly rounds were started in July 1957 and continued until January 1959, the spraying starting in October 1957. Altogether about 11,000 acres of woodland were treated, 1,300 gallons of "Dieldrex" having been used; the total cost of the operation was about 8 shillings per acre.

Analysis of the results showed that the apparent density was reduced by 98%, the remaining small population of *G. morsitans* indicating that eradication was not complete.

E. R. Nye

FOSTER, R. **Aircraft Applications of Insecticide to a Tsetse Habitat; the Auster J.5G Aircraft.** *Bureau Permanent Interafricain de la Tsé-Tsé et de la Trypanosomiase No. 216/0,* Leopoldville (Congo Belge). Misc. Rep. No. 213. 1958, Oct., 7 mimeographed pp.

Four experiments in the control of *Glossina swynnertoni* and *G. morsitans* in two isolated blocks of open woodland twenty miles south of Arusha, Tanganyika, are described. In the first experiment Block 1 (280 acres) was sprayed from an Auster J.5G aircraft with 5% w/v solution of gamma BHC. Dosage was 0·08 gallon per acre, the aerosol being dispensed by two rotary cage sprayers giving an aerosol with a mass medium diameter of about 50 microns. The swathe width was 70 yards. A 90% kill of adults was obtained, although the possibility that some surviving flies may have in fact been introduced after spraying meant that the kill was probably higher. The fly density remained low for two months after spraying when a sudden rise brought it up to a level higher than before treatment.

In the second experiment gamma BHC was applied to Block 2 (110 acres) which was a *G. swynnertoni* habitat. A similar spraying procedure produced a 96–97% kill which left a low density for about two months before rising sharply.

The third experiment relates to the effect of the gamma BHC spraying of Experiment 2 on an introduced population of *G. morsitans* (5,700 puparia introduced in the month preceding spraying). 98–99% kill of old males was recorded with no "recovery" of the population to pre-spraying levels after four months.

In the fourth experiment Block 1 was treated with a nominal dosage of 0·08 gallon per acre of 5% dieldrin solution. This spraying was carried out over three months after the original treatment with gamma BHC and after the fly population had become re-established. Four days after treatment the kill of old males was estimated at 97%, with a two months' period of low density before rising again.

It is considered feasible from the results of these experiments that satisfactory control would be obtained by intervals of 4 weeks between spraying, with 5% solutions at 0·08 gallon per acre. A 12 square mile area at Chungai, Central Province, was being treated on a similar basis to the foregoing experiments.

E. R. Nye

YEO, D. & SIMPSON, H. R. **The Effect of Repeated Insecticidal Applications on a Natural Tsetse Population. Colonial Pesticides Research, Arusha, Tanganyika.** *Bureau Permanent Interafricain de la Tsé-Tsé et de la Trypanosomiase No. 214/0,* Leopoldville (Congo Belge). Misc. Rep. No. 207. 1958, June, 13 mimeographed pp.

The effect of repeated applications of a non-persistent insecticide on natural populations of the tsetse fly has been investigated mathematically by a technique due to LESLIE (*Biometrika,* 1945, v. 33, 183).

Numerical calculations are based upon data derived from study of the life cycle of the fly. Certain basic assumptions are made: it is assumed among other things that there are no density-limiting factors which act upon the population as it declines, and that there is no change during a series of applications in the susceptibility of the tsetse fly to the insecticide (*i.e.*, no resistance).

The results obtained are discussed in the light of actual field experiments and it is noted that in some cases the reductions in tsetse populations were very much lower than predicted.

"It is concluded that an interval of four weeks or so between applications has some advantage over the interval of two weeks used in most earlier work."

[See also this *Bulletin*, 1955, v. 52, 344, 345, 346, 347; 1957, v. 54, 543.]

R. J. Wood

See also p. 895, PARR, **Studies on *Stomoxys calcitrans* (L.) in Uganda, East Africa. I. A Method of rearing Large Numbers of *Stomoxys calcitrans*.**

MAILLOT, L. Infection naturelle de *Glossina fuscipes quanzensis* Pires par *Trypanosoma cazalboui-vivax*. [**Natural Infection of *Glossina fuscipes quanzensis* by *Trypanosoma cazalboui-vivax***] *Bull. Inst. Études Centr-africaines*. (n.s.) 1959, Nos. 17/18, 71–86, 2 figs. [23 refs.]

See also p. 805, JACKSON, **Simultaneous Infections with *Plasmodium berghei* and *Trypanosoma lewisi* in the Rat.**

JAROSLOW, B. N. **The Effects of X or Neutron Irradiation, India Ink Blockade, or Splenectomy on Innate Immunity against *Trypanosoma duttoni* in Mice.** *J. Infect. Dis.* 1959, Mar.–Apr., v. 104, No. 2, 119–29, 7 figs. [18 refs.]

FULTON, J. D. & MATHEW, K. K. **Tracer Studies of the Distribution and Trypanocidal Action of Stilbamidine in Rats.** *Brit. J. Pharmacol. & Chemotherapy*. 1959, Mar., v. 14, No. 1, 137–41. [25 refs.]

"[^{14}C]Stilbamidine was used to study the distribution of the drug in the organs and tissues of rats following intravenous injection. The prophylactic action of stilbamidine was shown to depend upon the unchanged drug retained in tissues, especially the liver. Only the parent drug was extracted from trypanosomes when an infection was treated during the acute phase, as shown by the use of the fluorescent properties of stilbamidine in conjunction with scanning and chromatographic techniques. The action of stilbamidine on trypanosomes is therefore a direct one. A method for the synthesis of [^{14}C]-stilbamidine in much improved yield is also described."

RUIZ, A. & ALFARO, M. Presencia de *Trypanosoma rotatorium* en la sangre de ranas de Costa Rica. [**Presence of** *Trypanosoma rotatorium* **in the Blood of Frogs in Costa Rica**] *Rev. Biologia Trop.* San José, Costa Rica. 1958, Dec., v. 6, No. 2, 241–4, 5 figs.

The English summary appended to the paper is as follows:—

"The occurrence of *Trypanosoma rotatorium* in Costa Rica is recorded for the first time. The flagellate was found in the blood stream of specimens of *Rana pipiens* and *R. warschewitschii* caught in Santa Ana and San Pedro respectively."

LEISHMANIASIS

In this section abstracts are arranged as far as possible in the following order:—visceral, cutaneous, muco-cutaneous.

MOHIUDDIN, A. **The Behaviour of** *Leishmania adleri* **in Various Lizards.** *East African Med. J.* 1959, Mar., v. 36, No. 3, 171–6. [18 refs.]

"The behaviour of *Leishmania adleri*, a new species of the genus *Leishmania* isolated recently by Heisch from the heart blood of the African lizard, *Latastia longicaudata revoili* (Vaillant), was studied in various lizards. Twenty-five lizards belonging to *Mabuia striata, Agama mutabilis, Acanthodactylus boskianus asper* and *Lacerta viridis* were used for this purpose. The method of inoculation was heart puncture, although intraperitoneal and oral routes were also used.

"(1) It has been shown that *L. adleri* could only be demonstrated by culturing the heart blood of the infected lizard. All attempts to demonstrate the parasite in direct smears of blood and organs and mucus from the cloaca and from sections of the tissues have not proved successful. It has further been shown that although originally the parasite was isolated from an East African host, lizards belonging to different regions could be infected with it by intracardiac inoculation.

"(2) *L. tropica* and *L. donovani* were also used to inoculate the lizards similarly but failed to infect them."

FEVERS OF THE TYPHUS GROUP

In this section abstracts are arranged as far as possible in the following order:—general; louse-borne typhus, flea-borne typhus, mite-borne typhus; rickettsialpox; tick-borne typhus; Q fever, other rickettsial diseases.

WRIGHT, R. L. **Near-Fatal Anaphylaxis from Typhus Vaccine.** *U.S. Armed Forces Med. J.* 1959, Apr., v. 10, No. 4, 481–3.

"A case of severe anaphylaxis following subcutaneous administration of typhus vaccine is reported. This occurred in a patient with a long history of

allergy to eggs who had received multiple previous injections of egg-prepared vaccines with no ill effects. Review of the literature shows that less than 12 similar cases have been reported. Of these, two have been fatal. It cannot be emphasized too strongly that egg-prepared vaccines should not be given to persons with a suspected allergy to eggs and that, wherever and whenever such vaccines are given, appropriate emergency drugs such as epinephrine or the antihistamines should be available immediately."

KEKCHEEVA, N. G. **Experimental Studies on the Chemovaccinoprophylaxis of Rickettsial Diseases.** *Problems of Virology.* London. 1958, v. 3, No. 4, 223–7. [Translated from Russian.]

Guineapigs inoculated intraperitoneally with a mixture of living *Rickettsia mooseri* (10^4ID50) and chlortetracycline (1 mgm.) either showed no sign of illness (28 out of 33) or had only a slight febrile reaction (5 out of 33); the majority (7 out of 9 challenged at 20 days and 2 out of 4 at 95 days) subsequently proved to be immune to *R. mooseri,* their sera containing complement-fixing antibodies. At 37 days, 6 out of 7 animals were also immune to *R. prowazeki.* Similar results were obtained with *Dermacentroxenus sibiricus* (the rickettsia responsible for North Asiatic tick-borne typhus) in guineapigs, and with *R. burneti* in mice (in which there was evidence of persisting infection).

It is concluded that a single injection of a mixture of chlortetracycline and rickettsiae is a simpler and more reliable way of producing an asymptomatic infection than by inoculating living rickettsiae and subsequently giving repeated doses of the antibiotic. The cross-immunity between murine and epidemic strains suggests that organisms of the former (milder) type might be used for prophylaxis with less risk. *R. S. F. Hennessey*

HOPPS, Hope E., JACKSON, Elizabeth B., DANAUSKAS, J. X. & SMADEL, J. E. **Study on the Growth of Rickettsiae. III. Influence of Extracellular Environment on the Growth of *Rickettsia tsutsugamushi* in Tissue Culture Cells.** *J. Immunology.* 1959, Feb., v. 82, No. 2, 161–71, 3 figs. [45 refs.] **IV. Effect of Chloramphenicol and Several Metabolic Inhibitors on the Multiplication of *Rickettsia tsutsugamushi* in Tissue Culture Cells.** *Ibid.,* 172–81, 1 fig. [29 refs.]

III. *Rickettsia tsutsugamushi* (Karp strain) multiplied slowly in mouse fibroblast (L929) and lymphoblast (MBIII) cultures in media containing serum and chick embryo extract, but decreased rapidly in number when infected cells were maintained in non-protein solutions. Growth of rickettsiae in L929 cells occurred at 25°C., 35°C. and 40°C., with some delay at the lower and higher temperatures. It is suggested that rickettsiae may lose essential components when their host cells are inadequately nourished.

IV. Mouse fibroblast (L929) cultures infected with *R. tsutsugamushi* were freed of their infection when exposed to a concentration of 5 μgm. per ml. of chloramphenicol for 3–4 weeks, the rate of rickettsial inactivation being a function of temperature. This is interpreted as a rickettsicidal effect. Rickettsial multiplication was inhibited by cyanide or nitrophenol, and to a

greater extent by sodium azide; these compounds also inhibited growth of the host cells. β-2-thienylalanine, ethionine, and methionine sulphoxide suppressed rickettsial growth at concentrations which were not toxic to the host cell.

[See also this *Bulletin*, 1956, v. 53, 1415.] *R. S. F. Hennessey*

Yü, En-Shu & Wu, Hsien-Yi. **[Study on Morphological and Biological Differences between Two Types of *Trombicula deliensis* Walch]** *Acta Entomologica Sinica.* 1959, Feb., v. 9, No. 1, 66–74, 1 fig. [In Chinese.]

The English summary appended to the paper is as follows:—

"Two types of *Trombicula deliensis* have been recovered from rodents, and at times from one and the same animal, in Ping-Tang Island, off Fukien coast. A series of breeding experiments were performed. Their morphological and biological differences were found to be distinct and capable of being inherited.

"Morphologically, Type I is bigger, of dark red color; Type II, smaller, of light red color. The measurements of AP & PL of the larvae of Type I are longer than that of the larvae of Type II, whereas the measurement of SB is just the reverse.

"Biologically, Type I is more prolific, which lays more eggs, and eggs yield higher hatching rate. Type I requires 21 days only for its larvae to develop into full adult, while Type II needs 34 days for doing so. They differ too in their ability to stand different insecticides: for example, potassium sulfite has quicker action on Type II, 666 acts more rapidly on Type I.

"It was observed that a small percentage of eggs, laid by one type, may hatch out larvae morphologically and biologically indistinguishable from those of others. The two types described above are closely similar in their history of genesis and evolution."

Tanaka, R., Sugiyama, H. & Teramura, S. **A Clumped Distribution of Trombiculid Mites viewed from the True Home Range of Host Voles.** *Japanese J. San. Zool.* 1958, v. 9, 28–32.

This experiment was carried out in an area of grass and scrub among cultivated fields in Akita Prefecture. It is a scrub-typhus area, and the farmers who normally cut grass avoid the scrubby areas as dangerous. Scrub typhus is characteristically a disease associated with small patches of infected ground, appropriately called "typhus islands" by Audy [this *Bulletin*, 1950, v. 47, 27], which appear to be a reflection of the "mite islands" or clumped distribution of the vector mites. Here the vector species *Trombicula pallida* (72%), *T. palpalis* (21%), and *T. akamushi*, together with *T. japonica*, are maintained by the vole *Microtus montebelloi*. The voles were trapped, marked, released, and recaptured for an 8-day period in October 1954, the infestation being estimated by eye until the final day when they were killed and a full count made by suspending the bodies over water.

The observations by Harrison [*ibid.*, 1957; v. 54, 1169] that the trombiculid infestations of rodents on successive captures are closely correlated, and that different individuals have significantly different infestations, were amply confirmed. Within an area of only 1·7 acres, zones could be distinguished which, although not appearing to differ in soil or vegetation, did differ significantly in

the infestation rates of the voles. A home range of 0·14 acres was calculated for the voles on the results of mark-recapture, and it is concluded that the unequal distribution of infestation confirms this estimate. *J. L. Harrison*

TIMMS, G. L., HEISCH, R. B. & HARVEY, A. E. C. **Further Evidence that *Rhipicephalus simus* Koch is a Vector of Tick Typhus in Kenya.** *East African Med. J.* 1959, Feb., v. 36, No. 2, 114–15.

Rhipicephalus simus harbours rickettsiae of the *R. conori* type which causes a disease indistinguishable from tick typhus when inoculated into man [this *Bulletin*, 1948, v. 45, 328; 1958, v. 55, 144]. It has been suspected for a long time to be an important vector of tick typhus in Kenya and the authors now describe an infection in an Englishwoman which developed 7 days after she had removed a specimen of *R. simus* from her thigh.

She had no definite symptoms, but felt vaguely unwell: during the course of the next 4 days painful swellings occurred successively in the right and left inguinal glands and in those in the neck and axillae. The spleen was not palpable, there was no rash and the characteristic headache of tick typhus was absent. By the fourth day the patient's temperature had risen to 101°F. Tetracycline treatment brought about immediate improvement followed in 4 to 5 days by apparent recovery. For some months, however, the patient became tired easily and after 6 months the inguinal adenitis recurred but subsided spontaneously in a few days. Two specimens of serum taken at 7 weeks apart gave positive complement-fixation results at titres of 1 in 10 and 1 in 4 respectively for *R. akari* and negative and 1 in 2 for *R. conori* var. *pijperi*, and these were said to confirm that the patient had had tick typhus or rickettsial pox.

A guineapig inoculated with emulsions of the incriminated tick developed a scrotal reaction and rickettsiae of the *R. conori* type were seen in smears from the tunica. Another guineapig subinoculated with this organism developed complement-fixing antibodies to *R. conori* var. *pijperi* at a titre of 1 in 10. The patient was not available during the acute phase so that animal inoculation could not be accomplished at that stage.

The illness did not clinically resemble typical tick typhus and the possibility of subclinical rickettsial infection accompanying glandular fever cannot be excluded: however, glandular fever would not be expected to react so readily to antibiotics.

Various rodents (*Otomys angoniensis*—a species which has been shown to be a reservoir of tick typhus in Nairobi [*loc. cit.*]) were caught near the patient's house and sera from them were shown to have complement-fixing antibodies to *R. conori* var. *pijperi*. The authors are tempted to conclude that this was an example of "a back garden zoonosis". *H. J. O'D. Burke-Gaffney*

MODICA, R. & COSTA, A. La febbre "Q" in Tripolitania. [**Q Fever in Tripolitania**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1959, Jan., v. 40, No. 1, 53–60. [12 refs.]

The English summary appended to the paper is as follows:—

"Following the WHO recommendation, a survey was carried out to assess the incidence of 'Q' Fever in Tripolitania.

" 3,390 specimens of blood were tested against Henzerling Rickettsial Antigen by Complement Fixation, over a period of 3 years.

" 513 (15·1%) gave positive results, the titres ranging from 1/16 to 1/128.

" A limited number of goat and sheep bloods were tested using the same technique, giving 50% positive results.

" 2 patients showing typical rise in antibodies were found during the survey.

" The disease should be considered as endemic in Tripolitania."

Dolgov, N. V. **Q Fever in Voronezh Oblast.** *J. Microbiol., Epidemiol. & Immunobiol.* London. 1958, v. 29, No. 9, 1467–71. [Translated from Russian.]

The English summary appended to the paper is as follows:—

" (1) Analysis of the incidence of Q fever over 3 years (1955–57) showed that it was met in the oblast in the form of groups of cases (outbreaks), as a rule in a limited area, in 2–3 or more settlements situated close to each other. Isolated cases (4–12 or more) were also met, and were scattered in various settlements.

" (2) Most cases (82 per cent) occurred between March and June. The first cases of Q fever appeared in January. In October–December no case of Q fever was notified either clinically or by the laboratory.

" (3) The majority of those suffering from Q fever were adult workers—90·2 per cent, children under 7 years accounted for 1·3 per cent of the cases, and from 8–15 years 8·5 per cent, in children up to 3–4 years of age no case of Q fever was diagnosed. The number of cases among males was 586 (82·6 per cent) and among females 124 (17·4 per cent).

" (4) The majority of the patients were in constant contact with cattle (milk-maids, herdsmen, drovers), or worked on transport of fodder (silage, hay) from the fields to the farm. This suggests that infection took place in this category of person by inhalation. The alimentary (via raw milk) and also the inhalational routes were concerned in the infection of children, infants and other inhabitants of the collective farms not in direct contact with cattle. We could not detect any case of Q fever in our survey caused through bites from ticks (ixodiid and gamasid ticks are found everywhere in our oblast).

" (5) The positive complement-fixation reaction with *R. burneti* antigen among cows, which so far has been established only in 1 farm (in the village of Romanovka in Annenskii district), gives grounds for a widespread examination of cattle to be organized by the veterinary service, in the first place in foci of outbreaks of Q fever and for the organization of prophylactic measures (quarantine, boiling of milk from unsatisfactory farms) in foci of Q fever."

Vainshtein, M. A., Gazizova, G. R., Vasil'eva, L. D. & Chechel'nitskaia, S. E. **Studies on Q Fever in the Tatar A.S.S.R.** *J. Microbiol., Epidemiol. & Immunobiol.* London. 1958, v. 29, No. 9, 1474–82, 1 fig. [19 refs.] [Translated from Russian.]

The English summary appended to the paper is as follows:—

" (1) Two outbreaks of Q fever could be established on the territory of the Tatar A.S.S.R. between 1956 and 1957; 61 sporadic cases were detected in various districts of Kazan' town and the Republic.

" (2) The cases of Q fever were confirmed serologically by the complement-fixation test; the titre of the reaction varied considerably between 5 and 2560, as estimated at various periods of the illness.

" (3) The existence of Q fever in the Republic could further be confirmed by the positive results of animal inoculations carried out with the blood of the patients.

" (4) Studies of an outbreak of Q fever in Kazan' town led to the detection of the source of infection among small domestic ruminants and showed that in the focus in question the infection was airborne and dust-borne. It could further be established that the particular animal which served as source of infection (a goat) had excreted the causative organism over a period of 7–8 months. Inoculations carried out on guinea-pigs revealed that material collected in the focus (dung, dust) was contaminated with *Rickettsia burneti*.

" (5) Epidemiological studies on sporadic cases showed that 54 per cent of the patients in question had had contact with cattle. These patients had presumably been infected by inhalation or by the alimentary route. The actual source of infection remained obscure in the majority of cases.

" (6) Serological examination of 2 herds of cattle in the Lenin district of Kazan' town by means of the complement-fixation test gave a positive reaction with Q fever antigen in 37 of 337 cows (11·1 per cent).

" (7) The above studies warrant the conclusion that Q fever is widespread and plays a considerable part in the regional pathology of the Tatar A.S.S.R. Further studies of this infection and particularly regarding the possible existence of natural foci on the territory of the Republic are an absolute necessity."

LASHKEVICH, V. A. **The Results of Examination of Domestic Animals in an Endemic Focus of Q Fever in the Kirghiz S.S.R. for the Presence of Infection with** *Rickettsia burneti*. *J. Microbiol., Epidemiol. & Immunobiol.* London. 1958, v. 29, No. 9, 1472–4. [Translated from Russian.]

The English summary appended to the paper is as follows:—

" (1) A considerable proportion of the domestic animals of one of the settlements of the Kirghiz S.S.R. was shown to be infected with *R. burneti*. Complement-fixing antibodies were discovered in 27·4 per cent of cows and 28·5 per cent of goats examined, and also in sheep, pigs, donkeys and camels from this settlement.

" (2) The seasonal distribution of Q fever in this settlement (January–May) coincided with the period of breeding of the domestic animals on a large scale and with the massive appearance of infected material in the external environment from the placentas and discharges during birth, from the milk and the excrement.

" (3) During an investigation of samples of milk from 303 cows, 2 strains of *R. burneti* were isolated."

EVANS, A. D., POWELL, D. E. B. & BURRELL, C. D. **Fatal Endocarditis associated with Q Fever.** *Lancet*. 1959, Apr. 25, 864–5.

" A fatal case of infective endocarditis superimposed on calcific aortic stenosis is described.

" Rickettsia-like bodies were demonstrated in the heart-valve thrombus by Machiavello's stain.

" *Rickettsia burneti* was isolated from the aortic valve and spleen by guinea-pig inoculation."

Fedorova, N. I., Tav'ev, B. M. & Rumiantseva, E. V. **Specific Vaccination against Q Fever.** *J. Microbiol., Epidemiol. & Immunobiol.* London. 1958, v. 29, No. 8, 1257–62. [10 refs.] [Translated from Russian.]

A formalin-killed *Rickettsia burneti* vaccine which had been stored for 20 months at 4°C. caused relatively mild reactions and elicited complement-fixing antibody (average titre exceeding 1 in 30) in 156 out of 193 persons (81%) whose sera were tested between 3 and 8 months after receiving 2 inoculations separated by an interval of 15–20 days.

It is concluded that reactions to vaccination decrease in intensity with storage of this vaccine, immunological effectiveness being preserved. Persons whose sera contained specific complement-fixing antibody did not display allergic reactions when vaccinated. *R. S. F. Hennessey*

Shifrin, I. A., Rozhkov, F. V. & Truba, I. V. **Vaccination of Sheep against Q Fever.** *J. Microbiol., Epidemiol. & Immunobiol.* London. 1958, v. 29, No. 8, 1280–84. [Translated from Russian.]

Inoculation of year-old lambs with 3 weekly doses of a formalin-killed *Rickettsia burneti* vaccine stimulated comparatively rapid formation of complement-fixing antibody, with titres ranging from 1 in 64 to 1 in 512 after 46 days (from the first injection). When challenged with living *R. burneti* (by intravenous and intratracheal routes) at 65 days, rickettsiae were detected in the blood of one animal at 24 hours and in the faeces of 2 others at 24 and 96 hours, but not subsequently; antibody titres had approximately doubled (average 1 in 560) after 4 days. Rickettsiae were detected in the blood of 2 control lambs up to 7 days after challenge; the titre of antibody did not exceed 1 in 16 for more than 84 days in these animals.

" The absence of excretion of rickettsias in the faeces, urine and milk of the sheep, together with the extremely slow production of antibody in the control animals evidently indicates the weak reactivity of lambs in relation to *R. burneti*." *R. S. F. Hennessey*

YELLOW FEVER

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.

Macnamara, F. N., Horn, D. W. & Porterfield, J. S. **Yellow Fever and Other Arthropod-Borne Viruses. A Consideration of Two Serological Surveys made in South Western Nigeria.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1959, Mar., v. 53, No. 2, 202–12. [15 refs.]

A neutralizing antibody survey was made in Western Nigeria of 97 school-children at Ilaro, a town of 12,000 population, and of 207 people of all ages in

Ilobi village. The viruses used in the tests were Semliki Forest, dengue (Trinidad 1751), Uganda S, West Nile, yellow fever, Zika, Bwamba, Bunyamwera, and Mengo. The virus doses in the tests were 40–200 LD50 and fresh normal serum was not added. Mortality ratios and average survival times were used in computing the results [but the criteria used are not given].

In the Ilaro children, there was antibody to Bwamba in 77% and to Uganda S, yellow fever, and Zika in about half. 10% or less had antibody to the other agents; dengue antibodies were apparently not tested for in this group. At Ilobi, by the middle teens half or more had antibody to dengue, Uganda S, Zika, and yellow fever. Bwamba antibody was acquired by about half in the 20–29-year age-group.

The association between antibody and pairs and triads of viruses was analysed statistically and significant associations found between Zika + dengue, Zika + Uganda S, Zika + yellow fever, and (at Ilaro only) yellow fever + Uganda S.

Possible reasons for this are discussed and serological cross-reactions between these viruses, all group B arborviruses, seems the most likely explanation. However, the comparison of serological surveys in a community before and after an outbreak of yellow fever failed to show an increase in the incidence of Zika antibody, although the incidence of yellow fever antibody rose from 18/84 to 76/87. The high incidence of antibodies to Zika, Uganda S, and other related viruses in the forest belt of Nigeria is suggested as the explanation of the absence of epidemic yellow fever in the area—the effect is considered likely to be modification of the disease rather than the prevention of infections.

C. E. Gordon Smith

MEERS, P. D. **Combined Smallpox—17D Yellow Fever Vaccine for Scratch Vaccination.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1959, Mar., v. 53, No. 2, 196–201.

The results of a trial in Nigeria with a combined vaccinia—17D yellow fever vaccine administered by scarification are given in this paper. The components of the combined vaccine used in the trial were the dried smallpox and scratch yellow fever vaccines prepared routinely within the Federal Laboratory Service at Yaba. In preparing dried smallpox vaccine from the raw pulp harvested from sheep, the technique followed is largely that described by COLLIER [*Bull. Hyg.*, 1955, v. 30, 821], the vaccine lymph being purified by differential centrifugation [which eliminates any fragments of tissue, 1·25% peptone being added as a protective agent]. The resultant elementary body suspension (EBS) is distributed into ampoules in 0·3 ml. amounts (representing 25 doses) and freeze-dried in Edwards' centrifugal machine, the ampoules being sealed under vacuum. Potency, tested by titration (average pock counts) on the chorio-allantoic membrane of 12-day embryonated eggs, is ordinarily found to lie between 10^{-7} and 10^{-8}. The 17D mouse brain scarification vaccine produced at Yaba served as the yellow fever vaccine component. This is prepared as described by CANNON and DEWHURST [this *Bulletin*, 1955, v. 52, 1185], except that the dilution at the stage of maceration is increased, 2 ml. of water being added per brain, and 1 ml. of the resultant pulp being used for each 50-dose ampoule. The vaccine is freeze-dried and the ampoules are sealed after back-filling with nitrogen. Potency testing is by intracerebral inoculation into mice.

The combined vaccine was put up in 50-dose ampoules, 1 ml. of the yellow

fever brain pulp being added to 0·6 ml. of the vaccinial EBS and the resultant mixture freeze-dried; inasmuch as nitrogen is deleterious to the vaccinia virus, the ampoules were sealed under vacuum. In order to determine whether or not either of the components interfered with the other, or otherwise affected potency testing of the combined product, in each case the components were titrated before mixing in the wet state, and samples of each were dried separately to allow comparison between the dried products alone and in combination. Potency testing was carried out by titration on the chorio-allantoic membrane for the smallpox component and by the intracerebral inoculation of mice for the 17D component. Safety testing and bacteriological control of the combined vaccine were also carried out.

Trial of the combined vaccine was made on 43 healthy male 19- to 25-year-old Africans who, immediately before vaccination, were bled and had their smallpox vaccination state recorded. The contents of 2 ampoules were each reconstituted in 1 ml. of 2% gum arabic solution and pooled to reduce the effect of any variation between the ampoules. Vaccination was performed by placing a drop of the vaccine on the cleansed skin over the deltoid, making a simple cross-hatched scratch through the drop with a vaccinostyle, and then rubbing the vaccine into the scratches with the flat of the needle. 28 days after vaccination the group was again bled, and sera from the pre- and post-vaccination blood samples were paired and subjected to mouse protection testing.

Results of potency tests on the post-desiccation individual components and the combined product of 4 batches of combined vaccine showed that, while the titre of the smallpox component was in each case lower in the combined vaccine than in the same vaccinial component by itself, the 17D component showed a considerably higher titre in combination than alone. These differences were found experimentally to have been caused by the peptone included in the EBS: the peptone was shown to exert a protective influence on the 17D component, and the dilution of the peptone in the EBS by the addition of the 17D component to be deleterious to the vaccinia virus during freeze-drying. There was no evidence of interference or synergism between the 2 viruses in either the embryonated egg or in mouse brain to account for the differences in titre.

Results of vaccination with the combined vaccine are then given. Of the 43 Africans under test—all of whom had been previously vaccinated against smallpox or had had the disease—only 3, previously vaccinated in 2 cases within a month and the third in 1942, failed to show any reaction to the smallpox component, while 3 showed "immediate" reactions and the remaining 37 had varying grades of "accelerated" (vaccinoid) reactions. Of the 31, whose pre-vaccination sera gave negative protection results thereby indicating non-immunity to yellow fever, only 20 (64·5%) became immune as a result of vaccination—a conversion rate decidedly low in view of the fact that approximately 5,100 LD50 had been applied per person. This 64·5% protection compares unfavourably with the $85 \pm 5\%$ conversion rate ordinarily achieved in Nigeria [*ibid.*, 1957, v. 54, 1311], when previously non-immune persons are vaccinated with 17D chick-embryo or mouse-brain vaccine, but shows close agreement with the results recorded by Dick and Horgan [*ibid.*, 1953, v. 50, 403], who found that only 14 (66·7%) of 21 unprotected persons were successfully immunized with their combined vaccine.

The conclusion to be drawn from these results is that the combined vaccine in its present state does not produce a sufficiently high immunity rate against yellow fever to justify its routine use. It is suggested that the difference in the response shown by persons vaccinated with the combined vaccine and those vaccinated with 17D vaccine alone may be due to some local interference, presumably at the site of vaccination, which prevents invasion by the 17D virus in some cases. *G. Stuart*

DENGUE AND ALLIED FEVERS

GROSSBERG, S. E. & SCHERER, W. F. **Immunity in Group B Arthropod-Borne Virus Diseases. Accidental Dengue 1 Virus Infection in a Laboratory Worker with Antibodies to Japanese Encephalitis Virus.** *Amer. J. Hyg.* 1959, Jan., v. 69, No. 1, 60–67, 2 figs. [19 refs.]

A laboratory technician with pre-existing antibody to Japanese encephalitis virus was infected with dengue-1 virus apparently as a result of inoculating or harvesting mice infected with 13th mouse-passage Hawaii strain. The clinical disease was unmodified. The pathogenicity of the virus for mice was unaltered by one human passage. The patient's neutralizing antibody response was typical but he failed to develop complement-fixing antibody [see also this *Bulletin,* 1949, v. 46, 629]. *C. E. Gordon Smith*

BURGDORFER, W. **Colorado Tick Fever. The Behavior of CTF Virus in the Porcupine.** *J. Infect. Dis.* 1959, Jan.–Feb., v. 104, No. 1, 101–4, 5 figs.

Porcupines (*Erethizon dorsatum*) can serve as hosts of the immature and adult stages of the Rocky Mountain wood tick (*Dermacentor andersoni*) which is known to be a vector of Colorado tick fever virus. This paper describes experiments which showed that porcupines were highly susceptible to the virus when inoculated with suspensions of infected ticks or when infected ticks were fed on them. No obvious illness resulted, but viraemia occurred early, concentrations of virus up to 10^5 mouse LD50 per ml. being present between the 8th and 14th day; virus was detected in the blood of one animal up to 50 days after infection. Nymphal ticks fed on a viraemic porcupine became infected with the virus and were still infectious 25 to 60 days after feeding, when they had moulted to adults.

Neutralizing antibodies were not detected in sera collected from 2 "convalescent" porcupines [from one, 21 and 114 days, and from the other, 62 days after viraemia had ceased]. Re-inoculation of one of these animals resulted in a low viraemia [$10^{1.5}$ mouse LD50 per ml.] lasting only from the 3rd to the 7th day.

These results, along with the reported isolation of Colorado tick fever virus from a captured porcupine [this *Bulletin,* 1959, v. 56, 35], suggest that porcupines are involved in maintenance of the virus in nature. *R. S. F. Hennessey*

RABIES

STEINIGER, F. Über die Weiterverbreitung der Tollwut bei Wildtieren im Lande Niedersachsen im Jahre 1958. [**The Spread of Rabies in Wild Animals in Lower Saxony in 1958**] *Desinfektion u. Gesundheitswesen.* 1959, Mar., v. 51, No. 3, 38–9, 1 map.

The spread of rabies infection of wild animals into Germany from its eastern frontiers, probably as the result of the disturbances of war, has been fully described [this *Bulletin,* 1958, v. 55, 497, 647, 751]. This spread continued westwards but then ceased and the boundaries of the infection have remained almost constant since 1955. In the present paper there is reference to a previous communication [*ibid.,* 751] in which the hypothesis was put forward that the disease might be maintained by a reservoir of infection in small mammals which was as yet unknown and further that these " continental " kinds of small mammals did not occur in what is called the area of " Atlantic climate " which lies between the western boundaries of rabies infection and the sea. This hypothesis is to be tested in 1959 by the collection and examination of a variety of rodents and other small animals in an area of which a map is given. *M. E. Delafield*

MÖBEST, H. Über den Einfluss verschiedener Verdünnungsmittel auf die Infektiosität von Virus fixe-Suspension. [**The Influence of Different Dilution Media on the Infectivity of Suspensions of Fixed Rabies Virus**] *Zent. f. Bakt.* I. Abt. Orig. 1959, v. 174, Nos. 3/4, 165–74.

The author investigated the effect of various diluents on the infectivity of the Pitman Moore, Marburg and CV^S strains of fixed rabies virus, by determining the LD50 in mice of serial decimal dilutions of virus prepared in the diluents under examination. From the mean titres observed in 5 replicate experiments it was found that double distilled water gave a titre 1 log unit higher than normal saline, and the titre was increased further by 2·5 log units by the addition of 2% of horse serum. Higher titres were observed in similar experiments in which the mice had received an intracerebral inoculation of normal rabbit brain suspensions 16 days before infection. *D. J. Bauer*

HUYGELEN, C. & MORTELMANS, J. L'emploi du lapin dans les tests de contrôle des vaccins antirabiques. [**The Use of Rabbits in Control Tests of Rabies Vaccines**] *Ann. Soc. Belge de Méd. Trop.* 1958, Dec. 31, v. 38, No. 6, 1037–44. [26 refs.]

The English summary appended to the paper is as follows:—

" Nearly all rabbits, receiving a daily injection of phenolized rabies vaccine prepared from sheep brain, show inappetence and loss of weight; some of them die rather suddenly. The toxicity of the nervous substance has proven to be the cause of this phenomenon. The symptoms are wholly different from the paralysis observed sometimes in man and dog after anti-rabies vaccination.

" Consequently the use of rabbits in control tests of rabies vaccines has to be avoided, because at the very moment of the challenge with the test virus, they are in very poor general condition."

Villari, V., Coraggio, F., Mazzacca, G. & Bianco, R. Sul fenomeno di interferenza presentato da una entita virale, isolata da ratti portatori di mieloma di Oberling, Guérin e Guérin, di fronte all'infezione da virus rabbico nel topo. [**The Interference Phenomenon shown by a Virus, isolated from rats with Oberling-Guérin-Guérin Myeloma, in Mouse Rabies**] *Riv. Istituto Sieroterap. Ital.* 1959, Jan.–Feb., v. 34, No. 1, 64–72. [17 refs.]

The English summary appended to the paper is as follows:—

"Suspensions of brain tissue and tumour tissue of rats with Oberling, Guérin and Guérin myeloma, intracerebrally inoculated in mice infected with rabies virus, are capable of interference with the course of the rabic infection of mice. The same capacity is shown by HeLa cells culture fluids inoculated with the same material.

"The interfering factor associated with the above mentioned material is filterable and is destroyed by heating at 65°C and by U.V. rays treatment."

PLAGUE

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, rodent hosts, transmission, pathology, diagnosis, clinical findings, treatment, control.

Delwiche, E. A., Fukui, G. M., Andrews, A. W. & Surgalla, M. J. **Environmental Conditions affecting the Population Dynamics and the Retention of Virulence of** *Pasteurella pestis*: **the Role of Carbon Dioxide.** *J. Bacteriology.* 1959, Mar., v. 77, No. 3, 355–60, 2 figs.

"Studies on the growth characteristics of virulent and avirulent strains of *Pasteurella pestis* at 37°C in air and under nitrogen and in the presence of CO_2 (bicarbonate), aspartic acid or glutamic acid, have furnished the following results: (a) under aerobic conditions the avirulent cells in a population are capable of outgrowing the virulent members; (b) in the absence of oxygen (under N_2) the virulent cells in the inoculum can grow at least as rapidly as the avirulent cells, and the culture retains virulence; (c) carbon dioxide suppresses the initial rate of growth in air of both virulent and avirulent cultures, but in such a manner that the virulent cells of the 'virulent' inoculum continue to proliferate, with the end result that the initial ratio of virulent to avirulent cells is held approximately constant, and the culture retains virulence for the test animal; (d) aspartic or glutamic acids contribute toward the retention of virulence in a manner which may or may not be related to the CO_2 effect.

"An interpretation of the favorable effect of CO_2 (bicarbonate) on the retention of virulence is given in terms of CO_2 inhibition of terminal oxidative mechanisms with the consequent selective inhibition of the avirulent forms and the competitive outgrowth of the virulent members of the population within the initial inoculum."

[See this *Bulletin*, 1958, v. 55, 502 and 1959, v. 56, 41.]

HIGUCHI, K., KUPFERBERG, L. L. & SMITH, J. L. **Studies on the Nutrition and Physiology of *Pasteurella pestis*. III. Effects of Calcium Ions on the Growth of Virulent and Avirulent Strains of *Pasteurella pestis*.** *J. Bacteriology*. 1959, Mar., v. 77, No. 3, 317–21, 1 fig. [11 refs.]

"A factor present in milk which promoted the growth of virulent strains of *Pasteurella pestis* at 37°C. was identified as the calcium ion.

"Virulent strains of *P. pestis* required 0.002 to 0.004 M calcium ions for growth at 37°C in the basal synthetic medium containing 0·02 M magnesium salt. Avirulent strains grew without added calcium. The loss in virulence of *P. pestis* upon serial transfer in aerated liquid medium at 37°C was prevented by the presence of calcium salts.

"Strontium and zinc salts were able to replace calcium in the growth medium. In contrast to the apparent lack of a requirement for calcium by avirulent strains in the basal medium, a reduction in magnesium content to 0.0025 M resulted in a requirement for calcium by these strains. An antagonism by magnesium for calcium was indicated in the growth of virulent strains at 37°C."

[See this *Bulletin*, 1958, v. 55, 1006.]

ANISIMOV, P. I. **Cytology of *Pasteurella pestis* in the Process of Variation.** *J. Microbiol., Epidemiol. & Immunobiol.* London. 1958, v. 29, No. 8, 1200–205, 4 figs. [14 refs.] [Translated from Russian.]

This translation of the original Russian paper sets out to describe the changes in nuclear morphology of *Pasteurella pestis* during the R and S forms of growth, and in giant forms of the organism. Nuclei were demonstrated by Romanowsky-Giemsa, Feulgen and HCl-Giemsa methods. Some preparations appear to have been stained by one method but not others. Parallel observations were carried out by phase-contrast microscopy.

The resulting descriptions of the nuclear changes during a 16-hour growth cycle leave much to be desired. [Phase-contrast observations at 4 hours are referred to as being shown in fig. 1 in the text. Fig. 1 is a preparation stained by Romanowsky-Giemsa, magnification 300. Fig. 2, a phase-contrast preparation is said to be magnified 3,000 times, but the cells in both illustrations are of the same size.] Giant cells were obtained by growing *P. pestis* on a medium containing lithium chloride, magnesium sulphate or antibiotics. Enlarged sausage and filiform-shaped cells were seen containing masses of chromatin material. [No magnification is given with this illustration.] The giant nucleated cells were shown to be viable by following the growth of one cell in slide culture for 24 hours. The cell increased in size and crenations at the edges penetrated the cell, giving a convoluted effect. These segments multiplied and divided to give typical rod-shaped cells on the second day. It is suggested that giant cells are specially adapted forms which maintain the species in changed environments.

[It is not known whether the errors in this paper are due to the author or the translator. In either case it helps to emphasize that the greatest care must be taken by people translating scientific articles especially those written in a language like Russian, which few scientists themselves read.]

May F. McCallum

KOVALEVA, R. V. **Certain Characteristics of *Pasteurella pestis* Strains isolated in Mongolia from *Microtus brandti* and other Rodents.** *J. Microbiol., Epidemiol. & Immunobiol.* London. 1958, v. 29, No. 8, 1205–13, 4 figs. [11 refs.] [Translated from Russian.]

During an epizootic of plague in the Mongolian steppes, which mainly affected a species of vole (*Microtus brandti*), an atypical strain of *Pasteurella pestis* was isolated from a large number of the animals dying from the disease. Tarbagans and certain other voles were also infected with this strain but to a much less extent than Brandt's voles. At the same time a typical human infection, contracted from a tarbagan, was investigated. Cultures from both the patient and the tarbagan yielded *P. pestis* cultures which were normal in every way. The atypical strains from the voles showed differences in their colony characteristics and reduced virulence for guineapigs, but the most striking difference was the regular fermentation of rhamnose in 24–48 hours at 28°C. The strains were completely non-motile and a full investigation ruled out the possibility of a *P. pseudotuberculosis* infection, and the author considered the atypical strain to be a variant of the true plague bacillus, and the variation to be due to bacterial adaptation to conditions related to the *Microtus brandti*. *H. J. Bensted*

DZHAPARIDZE, M. N. & KULIKOVA, V. L. **The Effect of *Pasteurella pestis* on certain Aspects of the Metabolism of Animals susceptible to Plague—I. The Action of Enzyme Inhibitors of the Tricarboxylic Acid Cycle on Animals affected by *P. pestis* Toxin.** *J. Microbiol., Epidemiol. & Immunobiol.* London. 1958, v. 29, No. 9, 1490–96. [23 refs.] [Translated from Russian.]

The English summary appended to the paper is as follows:—

"(1) A considerable effect of enzyme inhibitors of the tricarboxylic acid cycle on animals affected by *P. pestis* toxin, expressed as a reduction of LD50 of the toxin, has been established.

"(2) Non-lethal doses of inhibitors reduced the LD50 of the toxin to different extents: barium monofluoroacetate gave a four or fivefold reduction, sodium fluoride and sodium arsenite reduced the LD50 by one-half and sodium malonate by one-third.

"(3) Sodium citrate and sodium succinate, which restored the Krebs cycle processes to normal, increased the resistance of white mice to the toxin and its LD50 increased correspondingly threefold and by one-half."

i. SMITH, P. N. **Pneumonic Plague in Mice: Gross and Histopathology in Untreated and Passively Immunized Animals.** *J. Infect. Dis.* 1959, Jan.–Feb., v. 104, No. 1, 78–84, 6 figs.

ii. ————————. **Pneumonic Plague in Mice: Modification of the Infection by Antibody against Specific Components of *Pasteurella pestis*.** *Ibid.*, 85–91, 5 figs.

i. Experimental pneumonic plague in mice appears to imitate fairly closely the picture seen in the human disease. In the present study the pathology of the untreated experimental disease is compared with that seen in animals treated

with antitoxin, anti-fraction 1 and whole plague antiserum, separately and in combination.

For the first 24–36 hours the naked eye pathology was similar in test and control groups with erythema of lungs only, and progressing to congestion with petechial haemorrhages in the visceral pleura. By 60 hours, when haemorrhagic patches of consolidation with serous exudation had developed, the control mice were showing enlarged spleens while the best protected animals had almost normal looking spleens. By the 4th day all the control animals were dead with marked consolidation of the lungs, which were covered with a purulent exudate, and very large spleens but no gross changes in the livers; the only survivors were serum-treated animals.

The histopathology was in general agreement with these findings but differences between test and control animals were seen earlier. At 48 hours the serum-treated mice showed circumscribed areas in the lungs of intense cellular reaction, whereas in the controls there was much less cellular infiltration but much haemorrhage, and by 60 hours there were massive haemorrhages into the alveolar spaces of the controls with many *Pasteurella pestis* to be seen in the large and small vessels. By the 4th day, with the appearance of more haemorrhagic lesions in the lungs, the localization, previously seen in the treated mice, began to break down. The spleens showed a great decrease in the size of the Malpighian bodies, but there was much less neutrophil reaction in the control spleens than in the spleens of the treated mice. The sinusoids of the control livers contained considerable numbers of *P. pestis*; the livers of the treated animals showed some circumscribed areas of intense cellular reaction. In general, it may be said that mice showing any resistance to the infection did so by virtue of the intense cellular response which tended to localize the infection and prevent or delay the wide dissemination of *P. pestis* and that the value of antiserum depended primarily on its power to allow this cellular response.

ii. Lung-counts of *P. pestis* in the test and control groups were not significantly different so that it would seem that serum treatment did not control the intensity of the primary infection in the lung. Plague antitoxin alone appeared to have little effect; anti-fraction I serum was a little more effective but whole anti-plague serum showed much better protection. The best results were obtained with a combination of anti-fraction I serum with whole anti-plague serum which clearly delayed dissemination from the lungs, decreased *P. pestis* titres in the livers and spleens and prolonged survival times.

Although it has been postulated that it was the toxins of *P. pestis* that damaged the lung parenchyma and facilitated the dissemination of the organism, it would seem from this work that antitoxin alone, or at least the preparation used, had little protective action and that nothing less than whole anti-plague serum was effective. *H. J. Bensted*

GIRARD, G. Comportement de la souris inoculée simultanément ou à intervalles rapprochés avec deux souches de *Pasteurella pestis*, l'une virulente, l'autre de virulence atténuée (souche E.V. Girard et Robic). **[Behaviour of Mice inoculated Simultaneously or at Intervals with Two Strains of *Pasteurella pestis*, one virulent and the other attenuated (Strain E. V. Girard and Robic]** *Bull. Soc. Path. Exot.* 1958, July–Aug., v. 51, No. 4, 547–53. [11 refs.]

In 5 experiments involving 100 mice a living attenuated vaccine of *Pasteurella pestis* protected 67% of the animals against inoculation of virulent living organisms either administered immediately after the vaccine on the opposite side or mixed with the vaccine, but if the virulent organisms were administered even 3 hours before the vaccine it failed to give any protection. Of the control animals which received only virulent organisms, only 1 survived. Control animals which received the attenuated vaccine all survived. Vaccine treated by heat to kill the organisms protected only 28% of the animals against the effect of the virulent organisms.

The protection given by the living attenuated living vaccine cannot be ascribed to antibody formation, but an explanation may be found in recent work by LANDY and PILLEMER [*Bull. Hyg.*, 1957, v. 32, 389] on stimulation of natural immunity in mice after administration of bacterial lipopolysaccharides from various sources. As the protection conferred by the vaccine is not immediate in the specific sense of an antigen-antibody reaction it is necessary to assume a non-specific action the study of which requires further investigation.

From a practical standpoint the experiments demonstrate the superiority of a living vaccine to a killed vaccine and moreover they show conclusively the absence of a negative phase in anti-plague inoculation with living organisms.

P. A. Clearkin

KALACHEVA, N. F. **Experimental Study of Combined Vaccination against Plague and Tularaemia.** *J. Microbiol., Epidemiol. & Immunobiol.* London. 1958, v. 29, No. 9, 1438–43. [Translated from Russian.]

This paper records the results of active protection tests in guineapigs of living vaccines prepared from *Pasteurella pestis* and *Brucella tularensis*. Both dried and liquid vaccines were used; the former was administered by a scarification technique on the skin of the guineapig's abdomen and the latter by the subcutaneous route. The vaccines were given separately into different batches of animals or as a combined prophylactic. After some preliminary trials a mixture of two strains of *P. pestis* was used; the dose for subcutaneous immunization was 1 ml. containing 10^9 bacterial cells and the dried vaccine for dermal vaccination was made up so that 2 drops contained 10^{11} *P. pestis*. The liquid *Br. tularensis* vaccine contained 10,000–100,000 cells per ml. and the dermal vaccine contained 2×10^9 *Br. tularensis* in 2 drops. When the combined prophylactic was used the two organisms were present in the same concentration. One month after a single immunizing dose a high level homologous challenge with adequate controls was given. The animals were found to be fully protected and there was no significant difference between the protection afforded by the separate vaccines and the combined prophylactic, whether the vaccinations were done subcutaneously or dermally. When, however, immunity tests were carried out after a period of 6 months subsequent to vaccination it was found that whereas subcutaneously injected guineapigs showed a significant loss of immunity, as measured against the homologous challenges, those immunized by the dermal showed no loss of protection against the experimental infections.

H. J. Bensted

CHOLERA

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

BEAM, W. E., Jr. **Effect of Excess Nitrite on Tests for Indole and the Cholera Red Reaction.** *J. Bacteriology.* 1959, Mar., v. 77, No. 3, 328–30.

It was found that a culture of *Vibrio cholerae* Inaba, which gave a typical cholera red reaction in an ordinary peptone water medium, failed to give the reaction when it was grown in a commercial indole-nitrite medium. The major difference between the two media was found to be the presence of 0·1% potassium nitrate in the proprietary medium, and further experiments showed that in tests for the production of indole with reagents containing paradimethylaminobenzaldehyde the concentration of nitrates in the medium should not be greater than 0·001%. It is postulated that this type of indole test is negative when the molar concentration of nitrite is greater than that of indole; the cholera red reaction will also be negative.

In connexion with the cholera red reaction it is of interest to recall that PALADINO-BLANDINI (*Ann. Igiene*, 1906, v. 16, 301) indicated that the indole and the nitrite must be formed in certain proportions and that if either is in excess the reaction might fail. *H. J. Bensted*

DOMARADSKII, I. V., ANOKHINA, C. V., KULIKOVA, V. L., DENISENKO, L. K. & MOSOLOVA, O. N. **The Use of the Phage Titre Increase Reaction for the Rapid Detection of** *Vibrio comma. J. Microbiol., Epidemiol. & Immunobiol.* London. 1958, v. 29, No. 7, 1124–8, 1 fig. [Translated from Russian.]

The presence of *Vibrio cholerae* in a culture was rapidly determined by adding a phage specific for this organism. A rise in phage titre was detected in 1 hour and plaques were visible in 3–4 hours. The method was of course more sensitive if the organism was allowed to multiply for a few hours in broth before the phage was added.

Small numbers of *Pasteurella pestis* have also been detected by the same method, with a phage specific for *P. pestis*. *Janice Taverne*

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

WAGENVOORT, C. A. & VAN THIEL, P. H. Autochtone amoebiasis in Nederland. [**Autochthonous Amoebic Dysentery in the Netherlands**] *Nederl. Tijdschr. v. Geneesk.* 1959, Apr. 4, v. 103, No. 14, 727–30, 4 figs. [14 refs.]

The English summary appended to the paper is as follows:—

"Severe diarrhoea followed by symptoms of ileus occurred in a farmer, aged 73, who had never been outside the Netherlands. He died shortly after

ileotransversostomy. Postmortem examination of the bowel revealed extensive ulceration of both colon and ileum, with great numbers of *Entamoeba histolytica,* notably in the submucosa. The way of infection and possible factors determining the virulence of amoebae are discussed."

JIMÉNEZ-QUIRÓS, O. Parasitosis intestinal en el universitario costarricense. II. Protozoosis. [**Intestinal Parasites in Costa Rican University Students. II. Protozoa**] *Rev. Biologia Trop.* San José, Costa Rica. 1958, Dec., v. 6, No. 2, 191–9.

The English summary appended to the paper is as follows:—

"A study is presented of the incidence of protozoan parasitosis in Costa Rican university freshmen. One thousand students of either sex were examined, and the symptoms exhibited were recorded along with the results.

"The total incidence of protozoan parasites was of 54·4 percent, a higher figure than we found for helminths [this *Bulletin,* 1959, v. 56, 170]. No significant difference was found in relation to sex.

"*Entamoeba coli* was the most frequent parasite (39·45%). Although usually considered a saprozoic species, the occurrence of digestive, hepatic, and nervous symptoms, smarting of the conjunctiva, and dysmenorrhoea in the host individuals suggests it may have a causal relation to these symptoms.

"*Entamoeba histolytica* was found in relatively low frequency (4·6%). Students parasitized by protozoa exhibited in general a greater incidence of observable symptoms, in varying degrees and combinations, than non-parasitized students; the most frequent symptoms were those mentioned above. Considering the effect of the symptoms recorded on students' general efficiency, and having observed an improvement after specific treatment, we believe all protozoan parasitosis cases should be treated, even if the species involved are not usually considered pathogenic."

REEVES, R. E.; MELENEY, H. E.; FRYE, W. W.; ISBELL, Dorothy. **The Cultivation of *Entamoeba histolytica* with Penicillin-Inhibited *Bacteroides symbiosus* Cells. I. A Pyridoxine Requirement** [REEVES, MELENEY & FRYE]. *Amer. J. Hyg.* 1959, Jan., v. 69, No. 1, 25–31, 1 fig. **II. A Pantothenate Requirement** [REEVES, MELENEY & ISBELL]. *Ibid.,* 32–7, 2 figs.

i. From the present investigation on the growth requirements of *Entamoeba histolytica* in a medium containing *Bacteroides symbiosus* inhibited by penicillin it appears that pyridoxine is essential for multiplication in a modified Shaffer-Frye medium [this *Bulletin,* 1957, v. 54, 1412]. The evidence was obtained by showing that growth in various strains of the parasite cultured with a mixed bacterial flora was inhibited by low concentrations of the antimetabolite desoxypyridoxol. The inhibitory effect of the latter substance was moreover reversed by any of the 3 components of the vitamin (B6). The sensitivity of 2 of the 5 strains of *E. histolytica* used, to the antimetabolite, remained unaltered after continued cultivation in its presence. This substance was also able to inhibit the growth of *E. histolytica* in a medium in which a mixed bacterial flora was allowed to grow unchecked. As the authors point out, the

effect of the antimetabolite may be directly on the amoebae or upon the accompanying organisms.

ii. NAKAMURA and BAKER [this *Bulletin,* 1957, v. 54, 288] had noted that for multiplication of *E. histolytica,* coenzyme A, but not pantothenate alone, was beneficial. The present authors have now shown that Ca pantothenate, pantethiene and coenzyme A were each capable of stimulating multiplication of this organism. In the modified Shaffer-Frye medium mentioned above, an acid-hydrolysate of casein free from vitamins replaced the more complex enzymatic digest of the same material. The other contents of the medium are described. The growth of accompanying *Bacteroides symbiosus* was inhibited by penicillin G. The vitamins to be tested were either added before autoclaving of the medium or sterilized apart and then added. Counts of amoebae were made at 48 and 72 hours after inoculation of each of the 5 strains used. The use of the new medium required addition of B vitamins for good growth and serial culture indicated marked need for pantothenate. This finding was confirmed by using pantoyltaurine as an antimetabolite in the new medium in which the acid-hydrolysate of casein was present. The addition of pyridoxal phosphate and coenzyme A to the medium with heat-treated *B. symbiosus* could not replace viable cells of this organism. *J. D. Fulton*

NAKAMURA, M. & EDWARDS, P. R., Jr., with the technical assistance of Thelma HOOD, Kathleen HARRIS & Bonnie PITSCH. **Enzymes of** *Entamoeba histolytica.* **I. Gelatinase.** *Proc. Soc. Exper. Biol. & Med.* 1959, Feb., v. 100, No. 2, 403–4. [15 refs.]

Six strains of *Entamoeba histolytica* were used, two of which consisted of large races and the others of small forms, for the demonstration of an enzyme which hydrolyses gelatin. For detection of the enzyme several tests were used. In one, thin films of gelatin with small amounts of phenol were prepared on glass slides and suspensions of amoebae were incubated on them at 20°C. for 12 to 24 hours in Petri dishes maintained in moist condition. Clear areas on the slide after staining with carbol-fuchsin indicated that hydrolysis of gelatin had taken place.

In another test, agar containing 0·4% gelatin was used and amoebae were incubated on plates of this material at 37°C. for the same period as above. A solution of mercuric chloride in HCl was then added to show up any gelatin left undigested since it gave a white precipitate with this material.

The amoebae were grown in absence of multiplying bacteria with addition of certain growth factors [this *Bulletin,* 1956, v. 53, 318] and washed several times with Ringer solution before use. Amoebae which had been grown with mixed bacterial flora were also washed a number of times and another culture was grown with *Escherichia coli,* which does not hydrolyse gelatin, as single associate. Suitable controls were also used, including bacteria which accompanied *E. histolytica* in culture, to find their effect on gelatin.

The most suitable *p*H for activity of amoebic gelatinase lay between 6·5 and 8. All the strains of *E. histolytica* were found to hydrolyse gelatin. Gelatinase activity was inhibited by a number of treatments.

[See also this *Bulletin,* 1959, v. 56, 613.] *J. D. Fulton*

De Carneri, I. Recherches sur l'origine possible des souches apathogènes de *Entamoeba histolytica.* [**Studies on the Possible Origin of Non-Pathogenic Strains of** *Entamoeba histolytica*] *Bull. Soc. Path. Exot.* 1958, July–Aug., v. 51, No. 4, 616–27. [36 refs.]

In discussing the evolution of *Entamoeba histolytica* the author considers the view that the ancestral form was a free-living organism like *E. moshkovskii,* which might have first given rise to non-pathogenic strains of *E. histolytica* living in the lumen of the gut as "minuta" forms, from which the pathogenic strains have evolved. On the other hand it is conceivable that the first strains to adapt themselves to parasitism were endowed with the power of ingesting tissue elements of the intestinal wall, in which case it would seem that the non-pathogenic strains of *E. histolytica* originated from the virulent ones by natural selection.

The latter hypothesis was accepted by the author as the basis for a series of experiments designed to ascertain whether pathogenic strains of *E. histolytica* can permanently lose their virulence and become non-pathogenic. For this purpose, in 4 strains which had lost their virulence as the result of prolonged cultivation, the "average degree of infection" (ADI), representing the mean for the scores of infection and ulceration produced in a batch of rats, was determined by intracaecal inoculation of these animals, after which attempts were made to restore their virulence by serial passages through the livers of hamsters. The effect of this was also tested by inoculation of rats with cultures recovered from the livers.

The 4 strains used in these experiments were isolated (1) from an abscess of the brain, (2) from cysts, (3) from a case of amoebic colitis and (4) from a case of amoebic dysentery. In all these strains the ADI was low after cultivation for periods from 3 to 13 years. In 2 strains passages through livers restored their virulence to 3·53 and 5, but in the other 2 the ADI remained low (1·0 and 1·77). However, since the initial virulence of the last two strains is unknown, no significance can be attached to these results. From these experiments the author concludes that, even if a strain of *E. histolytica* loses its pathogenicity under natural conditions, this must be a rare phenomenon. This conclusion is supported by the continued existence of pathogenic strains of *E. histolytica* after parasitizing for centuries in man, under conditions which would seem to be favourable to the natural selection of less virulent strains.

C. A. Hoare

Powell, S. J., Wilmot, A. J. & Elsdon-Dew, R. **Hepatic Amoebiasis.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1959, Mar., v. 53, No. 2, 190–95. [32 refs.]

The authors review the literature on "amoebic hepatitis" and conclude that 3 forms of it are described therein. These are (a) acute hepatitis, (b) subacute and chronic hepatitis, and (c) hepatitis associated with amoebic dysentery. The first condition, acute hepatitis, is clinically indistinguishable from amoebic liver abscess, though pus cannot be aspirated or its presence revealed by rupture. It responds to conservative anti-amoebic treatment, and is an early amoebic abscess or multiple small abscesses. The second, subacute or chronic, form is that causing most confusion as it is ill-defined in the literature and there is no factual proof of its pathology; at best it is very rare in Durban Africans. The

third, hepatitis in association with acute amoebic dysentery, is a tender enlargement of the liver commonly found in association with any ulcerative lesions of the colon, and does not justify the assumption that there is amoebic invasion of the liver.

In 1957 1,247 Africans attended a hospital in Durban with proven acute amoebic dysentery, which notoriously is severe in these patients. Among about a thousand autopsies on Africans in 1957 no evidence of "amoebic hepatitis" was seen other than that due to true amoebic abscess formation. Slightly tender liver enlargement is commonly associated with acute amoebic dysentery in the Durban Africans; but this responds to treatment with tetracycline and di-iodohydroxyquinoline in a manner which true amoebic liver abscess does not. It conforms to the third form, mentioned above, and the term "amoebic hepatitis" should not be applied to it. *A. R. D. Adams*

YOUNG, M. D. **The Treatment of Symptomatic Amebiasis with Puromycin.** *Antibiotic Med.* New York. 1959, Apr., v. 6, No. 4, 222–3.

"An adult case of *Entamoeba histolytica* dysentery was cured by 1 Gm. puromycin daily for four days. Two children with clinical amebiasis were cured with smaller doses." [See this *Bulletin*, 1958, v. 55, 406.]

COLSON, J. A., PEREIRA, S. & VANIER, G. Un nouvel antiamibien: la 4·7-phénanthroline-5·6-quinone. Résultats cliniques. [**Clinical Results with a New Anti-Amoebic Drug—4,7 Phenanthroline-5,6-Quinone**] *Maroc Méd.* 1958, Nov., v. 37, No. 402, 1160–62.

This drug [Entobex, Ciba 11,925C] was used for the treatment of 20 patients with amoebiasis; 8 of the 20 are said to have had acute amoebic dysentery, the other 12 had chronic amoebiasis. All the patients were given 2 tablets (0·05 gm. in each tablet) of the drug twice daily for 5 days; it was well tolerated. The acute amoebic dysenteries subsided within 2–4 days and the stools in all but 2 of these 8 patients were negative by the 6th day [but in 2 cases parasites had not even been found before treatment]. The symptoms ascribed to proven chronic amoebiasis subsided more slowly but satisfactorily in all but one patient, and the stools of all 12 patients became free from parasites. Over a period of observation of 4 months there were no relapses in those relieved by the treatment. *A. R. D. Adams*

SACHDEV, S. & MEHROTRA, R. P. **Treatment of Amebiasis with Preparation 11,925C.** *Indian J. Med. Sci.* 1958, Sept., v. 12, No. 9, 743–9.

This compound [Entobex] was given to 26 patients with parasitologically proven *Entamoeba histolytica* infections causing symptoms. The dosage was 3 tablets (each tablet containing 50 mgm. of the drug) thrice daily for 10 days. Symptoms were rapidly controlled in all patients and the cure rate was at least 81% (21 patients) at the end of 6 months' observation. [5 stools, it would seem, were examined during this period.]

[See also this *Bulletin*, 1959, v. 56, 163, 164, 443.] *A. R. D. Adams*

Shah, J. R., Amin, B. M. & Bonvini, E. **New Antiamebic Drugs in the Treatment of Patients with *E. histolytica* Trophozoites in the Stools.** *Indian J. Med. Sci.* 1958, Aug., v. 12, No. 8, 655–8. [10 refs.]

The drugs are *alpha*-dichloroacetamide-*beta*-chloro-*p*-chloropropiophenone (K 374) and N-(*beta*-oxyethyl)-N-[*p*-phenoxy-(4'-nitro)benzyl]-dichloroacetamide (Mebinol). Both are said to be amoebicidal *in vivo* as well as *in vitro*. 13 patients passing *Entamoeba histolytica* in their stools were treated with K 374, and 15 with Mebinol. The dosage of K 374 was 3 gm. daily (in 3 doses) for 10 days; that of Mebinol 1·5 gm. daily, similarly. Details are set out in tables. From these it seems that 7 of the patients treated with K 374 were cured; 5 temporarily improved and then relapsed (one of these was cured after a "double dose treatment"); and 2 gained no benefit. 3 of the last two groups were then included among the 15 patients treated with Mebinol. Of these 15, cure was obtained in 10; relapse followed in another 3; and no benefit was obtained in 2 cases. In all cases "cure" is based on 5 stool examinations during a 10-week period of post-treatment observation. No toxic side-effects of consequence attended the use of either drug.

A. R. D. Adams

Mehta, S. P., Padaria, F. T., Shah, U. S. & Rathi, M. M. **New Drugs in the Treatment of Intestinal Amoebiasis: a Therapeutic Evaluation.** *J. Indian Med. Ass.* 1959, Mar. 1, v. 32, No. 5, 197–9.

The drugs are dichloroacetamide derivatives. The first, *alpha*-dichloroacetamide-*beta*-chloro-*p*-chloropropiophenone, was given orally in doses of 1·0 gm. thrice daily for 10 days to 11 patients with intestinal amoebiasis; 3 were passing cysts during the week following treatment; 3 remained stool-negative for 20 weeks; of 4 others watched for up to 12 weeks 2 relapsed parasitically.

The second, N-(*beta*-oxyethyl)-N-[*p*-phenoxy-(1'-nitro)-benzyl]-dichloro-acetamide, was similarly given but in 0·5 gm. doses to 22 comparable patients. On completion 5 patients were passing cysts; 11 remained stool-negative for 20 weeks; 2 others relapsed within a month.

The third, N-(*beta*-ethoxyethyl) N-[*p*-phenoxy (4'-nitro)-benzyl]-dichloroacetamide, was given in doses of 0·2 gm. thrice daily for 10 days to another 6 comparable patients; some of these did not complete the treatment and no conclusions could be drawn from this test.

The authors conclude that the first two compounds were effectively curative in 72% and 77% respectively of the patients treated. No side-effects attended the use of any of these drugs.

A. R. D. Adams

Kasliwal, R. M. & Sogani, R. K. **Probable Pathogenicity of "*Entamoeba coli*".** *Indian J. Med. Sci.* 1958, Feb., v. 12, No. 2, 72–9, 1 fig. [10 refs.]

The authors report 43 cases of what they consider to be symptomatic amoebiasis solely attributable to *Entamoeba coli* infection and in the complete absence of *E. histolytica* infection. None of their patients suffered from acute dysentery; all had symptoms which ranged from "change of behaviour", backache or palpitation to more appreciable troubles like abdominal pain (usually vague) or loss of weight, which they ascribed to the *E. coli* infection.

In 2 cases what were considered to be amoeboid *E. coli* were recovered from small ulcers seen sigmoidoscopically. 34 of the 43 patients were treated with penicillin, emetine, and carbarsone or nivaquine or Enterovioform in sequence, together with liver extract, vitamin B complex and other symptomatic treatments deemed desirable. All very materially benefited from the " antiamoebic " course, and only 8 of the 34 continued to pass *E. coli* in the stools thereafter.

[Any indication of pathogenicity of *E. coli,* if it was in fact this parasite, appears to the abstracter to be entirely unconvincing.] *A. R. D. Adams*

Ruiz, A. & Alfaro, M. '*Dientamoeba fragilis* en Costa Rica. [*Dientamoeba fragilis* **in Costa Rica**] *Rev. Biologia Trop.* San José, Costa Rica. 1958, Dec., v. 6, No. 2, 201–3, 5 figs.

The English summary appended to the paper is as follows: —

" *Dientamoeba fragilis* Jepps and Dobell is reported in Costa Rica for the first time. The small trophozoites seen in fresh material were clearly identifiable upon staining with Haidenhain's haematoxylin."

La Rosa, F. & Tigano, F. Rettocolite mucosa con presenza di *Giardia lamblia.* [**Mucous Rectocolitis associated with** *Giardia intestinalis*] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1959, Feb., v. 40, No. 2, 93–100. [26 refs.]

The English summary appended to the paper is as follows: —

" After a review of the literature on the rectocolitis from lambliasis the authors report a case of mucous proctitis with localisation of Giardia lamblia which was cured by acridine treatment. Following a short discussion they come to the conclusion that Giardia lamblia can acquire a pathogenous power under particular conditions and only seldom induce anatomo-clinical pictures quite similar to the one the authors have studied."

Coutinho, J. O. & Rabello, E. X. Contribuição para o estudo dos protozoários intestinais do porco (*Sus scrofa domesticus*). [**Study of Intestinal Protozoa in Pigs**] *Arquivos Facul. de Hig. e Saúde Pública Univ. de São Paulo.* 1958, June, v. 12, No. 1, 67–78, 5 figs. [14 refs.]

The English summary appended to the paper is as follows: —

" The authors examine formed feces of pigs, trying to find cysts of *Entamoeba histolytica* in these animals, considered reservoir of the pathogenic *Entamoeba* of men by some authors.

" Out of 312 animals examined, 94,87% were positive for cysts of intestinal protozoas. It was found: *Entamoeba polecki* in 67·95%, *Iodamoeba bütschlii* in 53·21%, *Endolimax* sp. in 8·97%, *Balantidium coli* in 17·31%, *Giardia* sp. in 0·64%, *Eimeria* sp. 41·35%, *Trichomonas* sp. in 0·64%, *Chilomastix* sp. in 1·28%.

" They discuss the different species of amoebidae found in pigs, considering *Entamoeba polecki* (Prowazek, 1912) and *Iodamoeba bütschlii* (Prowazek, 1912) the most frequent.

" They refer to negative findings in relation to *Entamoeba histolytica,* coming

to the conclusion that pigs, in normal conditions of life, are not reservoir of this rhizopod of men."

[See this *Bulletin,* 1957, v. 54, 1084.]

RELAPSING FEVER AND OTHER SPIROCHAETOSES

TERAVSKIĬ, I. K. [*Ornithodorus lahorensis* **Neumann as a Reservoir of Central Asiatic Tick-Borne Relapsing Fever**] *Zool. Zh.* Moscow. 1956, v. 35, Pt. 12, 1820–24. [17 refs.] [In Russian.] English summary, Suppl. p. 7. [Summary taken from *Rev. Applied Entom.* Ser. B. 1959, Apr., v. 47, Pt. 4, 62–3.]

Ornithodoros lahorensis Neum. is widely distributed in Transcaucasia and Soviet Central Asia and often occurs there in natural nidi of tick-borne relapsing fever, but has frequently been found not to transmit the latter by bite [*cf. RAE*, B, 1952, v. 40, 211 etc.], the spirochaetes being confined to the digestive tract. In experiments, the defibrinated blood of a guineapig infected with Central Asian relapsing fever was injected into the body cavity of *O. lahorensis* by means of coxal puncture. Many of the ticks died after a few days, but some survived long enough for the fate of the spirochaetes to be determined. They were found to survive for only 7–9 days in the body cavity, and were not found in any of the internal organs, including the salivary glands. At no time were they transmitted to guineapigs by bite. The spirochaetes persisted for up to 24 days in the digestive tract of ticks that had fed on an infected guineapig, and they then disappeared; they remained mobile for only five days. Secretions of the gut and salivary glands had no effect on them. It is concluded that *O. lahorensis* provides an unfavourable environment for the spirochaetes and is of no importance as a reservoir for them in nature.

SHUSTROV, A. K. [**The Problem of the Distribution of Ticks of the Genus** *Ornithodorus* **in Transcaucasia**] *Zool. Zh.* Moscow. 1956, v. 35, Pt. 7, 986–9. [18 refs.] [In Russian.] English summary, Suppl. p. 5. [Summary taken from *Rev. Applied Entom.* Ser. B. 1959, Apr., v. 47, Pt. 4, 62.]

Examples of *Ornithodoros verrucosus* Olen., Zas. & Fen. infected with relapsing-fever spirochaetes have been found on various occasions since 1933 in Transcaucasia and the Northern Caucasus. A second species of the genus, *O. alactagalis* Isaakyan, was recorded from Armenia in 1936, and this was also found naturally infected with spirochaetes, but it has been less frequently recorded and its wider distribution was unknown. Investigations were made in 1951–52 on the distribution of the two species in natural nidi of the disease in Transcaucasia, and the results, which are recorded in detail, showed that both occurred widely in the burrows of rodents and other mammals in Azerbaidzhan. They were frequently found in the same biotopes, although *O. alactagalis* was commoner in small burrows and *O. verrucosus,* which was the more numerous of the two, in medium and large ones. Adults of the

latter from two places transmitted relapsing-fever spirochaetes to guineapigs on which they fed in the laboratory. *O. alactagalis* was also found in rodent burrows near Echmiadzin, in Armenia.

EL-ZIADY, Samira. **The Behaviour of *Ornithodoros erraticus* (Lucas, 1849), Small Form (Ixodoidea, Argasidae), towards certain Environmental Factors.** Reprinted from *Ann. Entom. Soc. of America.* 1958, July, v. 51. No. 4, 317–36, 1 fig. & 11 pls. [14 refs.]

The reactions of hungry and engorged female *Ornithodorus erraticus* to temperature, humidity, odour, gravity and light were studied, with apparatus similar to that described by WIGGLESWORTH in studies on the behaviour of the human louse [this *Bulletin,* 1941, v. 38, 417]. The ticks were active between 70 and 94°F., but at higher temperatures, 104° and 110°F., became sluggish. Engorged ticks given a choice of temperature chose the lower temperature, but were unable to distinguish between 75° and 84°F. or 80° and 90°F., although distinguishing between 80° and 95°F. Engorged females also avoid high (95–100% RH) humidities. Hungry ticks select higher temperatures, even when given a choice between 80° and 106°F., and also select higher humidities.

Hungry ticks were attracted by the odour of ammonia, acetic acid and the hair of gerbils, rabbits and guineapigs, but were not attracted by the faeces of these animals. There was evidence that the ticks were able to distinguish between the odour of different animals.

Both hungry and engorged ticks avoid light, although this species is eyeless, but hungry ticks were negatively geotactic and climbed up a tube, whereas engorged ticks congregated at the bottom of a tube.

Ticks with Haller's organ removed no longer perceived differences in odours, but continued to react to temperature and humidity differences. Ticks with the palpi non-functional were unable to engorge. There is evidence that the light receptors are present on the anterior part of the body but that temperature and humidity receptors are scattered over the whole body. *B. R. Laurence*

LANZO, A. Osservazioni sulla febbre ricorrente in Somalia. [**Observations on Relapsing Fever in Somalia**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1959. Feb., v. 40, No. 2, 101–6, 2 figs.

The English summary appended to the paper is as follows:—

"The author reports on some clinical and therapeutic observations made on 540 cases of relapsing fever, in Eritrea, during 1958. The 64% of the cases presented intense icturus with frequent signs of serious hepatic compromission; the author described even an interesting case of epidermolisis bullosa, finding spirochetes in the fluid of the cutaneous bubbles. The author recommends again Aureomycin particularly in cases with complications."

GEERTS, J., MEYUS, H. & BERVOETS, W., with the collaboration of H. CAUBERGH. Lutte contre l'*Ornithodorus moubata* dans deux territoires du Ruanda-Urundi. [**Control of *Ornithodorus moubata* in Two Zones in Ruanda-Urundi**] *Riv. di Parassit.* Rome. 1958, July, v. 19, No. 3, 209–14.

Hexachlorcyclohexane (Solvexane 50B, and also Cyclotox Solvay) has proved successful in the control of *Ornithodorus moubata* and relapsing fever in an area of Ruanda-Urundi containing 140,000 inhabitants. The concentration of Solvexane used was 500 gm. per 10 litres of water, applied at a dosage of 40 cc. per square metre. The soil in the huts and the walls up to 1 metre off the ground were treated at intervals of 6 months during 1950 to 1952. A total of 56,131 huts were treated once, twice or three times. Ticks were found to die within 3 days after contact with HCH, but the eggs were not killed.

Before the campaign, in 1948 and 1949, there were 832 and 909 cases of relapsing fever in the area. In 1950, in the first year of the campaign, 610 cases were reported: 76 cases in 1951 and 9 cases in 1952. No cases of relapsing fever acquired locally were recorded in 1955, 1956 or 1957, three to five years after the campaign.

There is no indication of the cost of these measures. *B. R. Laurence*

YAWS AND OTHER TREPONEMATOSES

BLEWETT, J. **Manifestations of Yaws in Great Britain.** *Brit. J. Radiol.* 1959, Mar., v. 32, No. 375, 198–201, 3 figs.

"Amongst West Indian emigrants, a certain number will show bone abnormalities due to yaws. Apart from their recognition as such, they are of little clinical importance except in rare cases where a relapse must be differentiated from syphilis."

LEPROSY

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

VULCAN, P. Probleme de epidemiologie si profilaxie a leprei în țara noastră. **[Problems related to the Epidemiology and Prophylaxis of Leprosy in this Country]** *Microbiol., Parazitol si Epidemiol.* Bucharest. 1958, May–June, v. 3, No. 3, 201–11, 3 figs.

LEWIS, R. A. & EDWARDS, R. **A Statistical Study of 1,000 Cases of Leprosy observed in Rangoon for approximately Two Years.** *Internat. J. Leprosy.* New Orleans. 1958, July–Sept., v. 26, No. 3, 236–51, 1 fig.

According to a recent survey there are 3,035 segregated cases of leprosy in Burma, and probably about 100,000 altogether in a population of 17·5 million, though some put the total number at twice that figure. The authors, by means

of punch cards, collected particulars of some 1,000 cases for a period of 2 years, at a Special Skin Clinic of Rangoon General Hospital.

The disease was most frequent in the 10 to 14 year age-group. The incidence of leprosy in Rangoon and its environs was highest among Indians, next in Muslim-Burmese, less in Burmese, and least in Chinese; but the lepromatous type rate was in the inverse order. Erythema nodosum leprosum was twice as frequent in Burmese patients as in Indians. Except in young children leprosy was more frequent in males than in females, as was also the occurrence of deformities. One-third of all cases became inactive in the period, while 17·5% became bacteriologically negative under treatment. *Ernest Muir*

BROWN, J. A. K. **Factors influencing the Transmission of Leprosy.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1959, Mar., v. 53, No. 2, 179–89, 3 figs. & 1 map. [17 refs.]

From his 7 years' experience of leprosy in E. Africa the author puts forward certain theories as to the causes of varying prevalence in different areas. In his opinion climate, density of population and overcrowding are only of secondary importance. Prevalence depends on the human factor, upon the degree of susceptibility or resistance. WADE and LEDOWSKY are quoted [this *Bulletin,* 1952, v. 49, 963]. "They believe that some other inherent and fundamental factor is involved, and that resistance to attack is distinct from resistance to the progression of an already engrafted disease." It is mentioned that where 3 tribes, the Banyoro, Batoro and Baganda are immediate neighbours and there is no barrier to their mixing freely, the incidence of leprosy is low among them all. But in a small section of the Banyoro which is more isolated geographically the incidence is as high as 30 per 1,000; and among the Chopi, who are still more isolated, there is an incidence of 41 per 1,000.

A suggestion is made that susceptibility is dependent on close intermarriage, and that when there is wider mixing among tribes and races susceptibility becomes less and the disease tends to die out. It is suggested that this may have been one of the reasons for the disappearance of leprosy from Great Britain—the opening up of the country and the expansion of the marriage circle. It is suggested that susceptibility behaves genetically, but is not dependent on a single gene; there may be permutations that produce quantitative differences in immunological status in different persons, and hence different forms of leprosy. *Ernest Muir*

MONTEL, M. L. R. Les "inconnues" du problème de la lèpre. [**Unknown Factors in the Leprosy Problem**] *Bull. Soc. Path. Exot.* 1958, Sept.–Oct., v. 51, No. 5, 698–708, 4 figs. on 2 pls. [30 refs.]

The little understood or unexplained matters connected with the leprosy problem are numerous, and every advance made in our knowledge seems to open out fresh vistas. This paper is really a summary of these yet undisclosed matters put forward in the hope that through research their number may be reduced. A few examples are here mentioned.

The present classification of leprosy, by pressing analysis too far, seems to

destroy the undoubted unity of the disease. The expression " incubation period " should not be used ; " latent period " should be substituted. The whole difficulty of cultivation and inoculation of the leprosy bacillus is discussed, and particularly to what extent the masses of bacilli found in the tissues of the body are alive or dead. Particular attention is given to the acid-fast granules found in the tissues, especially in old lesions and after sulphone treatment. The phenomenon of centrifugally spreading tuberculoid lesion is described and is compared to the rings found in the cross section of a tree. The skin reactions of Mitsuda and Fernandez are discussed and the need is expressed for the use of a purified antigen. More study should be given to the activation of the Mitsúda reaction by the use of BCG. Study of lesions of the liver by means of puncture biopsies is recommended so as to find out: (i) if there is an initial gastro-intestinal infection ; (ii) whether liver lesions persist after clinical healing ; (iii) what length of treatment is necessary. Clinical study is needed particularly to understand the nature of lepra reaction.

While acknowledging the efficacy of sulphones in treatment, the author states that one cannot yet say if a patient is actually cured of leprosy. The reactions of sensitization to drugs require further study. We are still completely ignorant of the ways in which certain patients recover spontaneously without treatment.

Ernest Muir

De Souza-Araujo, H. C. **The Morphology of** *Mycobacterium leprae*. *Leprosy Review*. 1959, Apr., v. 30, No. 2, 80–84, 31 figs. on 4 pls.

These studies were made by electron microscopy at magnifications of 4,000 and 7,800 X, with smear preparations, and by phase contrast microscopy at magnifications of 400 and 1,000 X.

The cell membrane of *Mycobacterium leprae* was seen most clearly by phase-contrast microscopy ; it circumscribed the cytoplasm, which seemed to be liquid with the granules in constant movement. The gloea appeared as a clear halo by phase contrast, and in the electron photographs as a white sheet surrounding the bacilli ; similar structures were seen around murine leprosy bacilli taken from abscesses of mice. Although the appearance of the metachromatic granules, or as they are now more commonly called, the mitochondria, is not described and neither are these granules clearly seen in the photographs, they are discussed ; the author considers that they are the original elements of the bacilli, and that they are the cause of tuberculoid leprosy.

Phase contrast microscopy shows that granular bacilli have a slow progressive, screwing, skipping or stroke motion, and from them a larger granule has sometimes been seen to be extruded ; occasionally this granule has developed a peduncle, becoming comet-like and finally a new bacillus.

Bacilli from the intracutaneous lesions of erythema nodosum rather than from lepromatous lesions are considered best for studying this organism by ordinary microscopy. Fontes method of staining is considered particularly valuable for demonstrating the dark-staining intracellular granules ; it is from the centrally situated granules, which incidentally are the largest ones, that gemmules or branching develop.

In general, the murine leprosy bacillus is thinner than the human bacillus and its granules are smaller, but otherwise the bacilli are very similar.

S. R. M. Bushby

CONTRERAS, F., Jr., SOTELO, C. & GÓMEZ MENDOZA, A. Estudio de la sustancia fundamental amorfa en la dermis de los enfermos de lepra. **[Study of the Basic Amorphous Substance in the Dermis of Leprosy Patients]** *Rev. Fontilles.* Alicante. 1958, July–Dec., v. 4, No. 6, 433–44. 15 figs. on 5 pls. [14 refs.]

Using the periodic-acid-Schiff (PAS) reaction and the "Methylene Blue Extinction Test" (MBE), the authors made a study on the changes in the stroma of the skin in lepromatous and in tuberculoid leprosy. The PAS reaction showed that in both the lepromatous and the tuberculoid type of leprosy the stroma contains mucopolysaccharides and mucoproteins, and that the destruction of collagen corresponds to the production of mucopolysaccharides. The MBE reaction showed that in the part of the dermis which is not infiltrated with leproma, acid mucopolysaccharides are present in a state of great polymerization, while in the infiltrated zones there may be a similar content but in a state of less polymerization. Conclusions regarding the stroma in tuberculoid cases have not yet been made clear. *Ernest Muir*

LUNDIN, F. E., Jr. & ROSS, Hilary, with the technical assistance of O. A. AMEDEE. **Electrolyte Studies in Leprosy.** *Internat. J. Leprosy.* New Orleans. 1958, July–Sept., v. 26, No. 3, 252–7.

This paper from the United States Public Health Service Hospital in Carville, Louisiana, intends to add some basic information on electrolytes to what is already known about leprosy. 143 patients with leprosy were studied. 100 of them were uncomplicated lepromatous cases of which 85 were positive bacteriologically. There were 28 complicated lepromatous patients, and 15 showed the tuberculoid type of the disease. Alkali reserve, total protein, albumin-globulin ratio, chlorides, sodium, potassium, calcium and magnesium were determined, and the following table shows the number of leprosy patients where all the values were normal.

Numbers of leprosy cases with normal serum electrolyte values

Case group	No. of cases	Normal values in all analyses
Lepromatous active (bacteriologically positive)	85	21 (24·7%)
Lepromatous, arrested (bacteriologically negative)	15	9 (60·0%)
Lepromatous with erythema nodosum leprosum	24	5 (20·8%)
Lepromatous with amyloid nephrosis	4	0 (0%)
Tuberculoid (8 active, 7 inactive)	15	9 (60·0%)

The values in the 4 lepromatous patients with amyloid nephrosis showed no uniform changes in normality. 3 of them showed considerable acidosis, 2 had a very low serum albumin, and 2 a very low serum calcium. This may, however, have been related to the low albumin. In the 85 clinically active (*i.e.*, bacteriologically positive) patients with uncomplicated leprosy, 33 showed a reversal of the albumin-globulin ratio, and 20 presented with an abnormally low alkali reserve. The average result obtained in the 24 lepromatous patients with erythema nodosum showed no principal difference from those obtained

from the uncomplicated cases. X-ray examinations of hands and feet were taken 6 to 27 months apart, but there was no definite relationship between bone changes and serum calcium and phosphorus. *H. Lehmann*

Terencio De Las Aguas, J. La proteína C reactiva en la lepra. [**C Reactive Protein in Leprosy**] *Rev. Fontilles.* Alicante. 1958, July–Dec., v. 4, No. 6, 445–53. [13 refs.] English summary.

C reactive protein (PCR) is the specific protein which appears in the blood serum as a result of inflammatory changes. It is so called because it was noticed that the serum of patients with acute pneumonia gave a reaction of precipitation with the substance C—a polysaccharide extracted from the body of the pneumococcus.

The PCR was tested in 58 lepromatous and 2 tuberculoid leprosy patients. Positive results were obtained in 41·03% of the lepromatous patients, but the positivity was proportionate to the advance of the disease, and became less as the patient advanced towards recovery. One tuberculoid patient was positive and the other negative.

Results corresponding to those of other tests, indicating changes in the blood protein, were found. *Ernest Muir*

Tarabini C., G. & Guillén P., J. Formolgelificación modificada por Linke y col. en enfermos hansenianos. [**The Formol-Gel Test as modified by Linke et al. in Leprosy Patients**] *Rev. Fontilles.* Alicante. 1958, July–Dec., v. 4, No. 6, 461–8. [16 refs.] English summary.

The formol-gel test is recommended for various reasons. The modification (*Deutsch Med. Woch,* 1957, v. 82, 879) consists in adding 14% calcium chloride in equal parts to the formalin before adding it to the serum. The test is recommended because of its simplicity and speed. The positivity is measured by the speed of gelification: 4 plus in 2 minutes, 3 plus up to 4 minutes, 2 plus up to 6 minutes, and 1 plus up to 8 minutes. It shows a rise of gamma globulins in the blood and also a rise of alpha and beta globulins; high positivity indicates renal complications, hepatic disturbances and lepra reactions; in cured patients it may be used to indicate the total disappearance of dysproteinaemia. *Ernest Muir*

Tarabini C., G. Importancia de los estudios comparativos sobre la actividad de las leprominas de distintos países. [**The Importance of Comparative Studies on the Activity of Lepromins from Different Countries**] *Rev. Fontilles.* Alicante. 1958, July–Dec., v. 4, No. 6, 455–9.

The author, in order to test the reaction-producing power of different lepromins, brought samples from the Belgian Congo and other countries and tested them alongside of samples taken from various internal organs of patients at Fontilles. Considerable differences in the degrees of positivity were obtained.

As a result of this study he lays down certain rules in connexion with the preparation of lepromin. It should be purified so as to get rid of tissue debris. It should be standardized so as to contain a fixed number of bacilli per cmm.

As it is becoming increasingly difficult to obtain bacilli, material should be gathered at autopsies from the various organs of the body. A distinction is made between lepromin taken from the organs of the body and that procured by culture, as the former has been modified by exposure to the action of the tissues of the body, while the latter is a complete antigen.

It is hoped that culture may soon be possible as a source of lepromin.

Ernest Muir

Sato, S. & Fukuda, M. **Marked Increase in Mitsuda Positivity in Lepromatous Cases with reference to Clinical Features.** *Internat. J. Leprosy.* New Orleans. 1958, July–Sept., v. 26, No. 3, 205–18. [29 refs.]

The authors carried out 2 series of Mitsuda tests in leprosy patients, one in 1954 in 1,400 cases, and one in 1957 in some 200 cases. The authors were surprised to find that in the former test 85·2% were positive, and in the latter, 84·2%.

It is generally accepted that, except in a few unusual conditions, the Mitsuda reaction is negative in lepromatous leprosy; but in 840 of the 1,400 of the former group it was found that 682 were classified as lepromatous on "the basis of history and the clinical picture". Of the second group 177 were examined and of them 139 were similarly found to be lepromatous.

The authors consider that the criterion of positivity of the Mitsuda reaction as defined by the Madrid Congress and the WHO standards should be changed, and reactions with a nodule less than 7 mm. in diameter should be considered as negative.

[In this article the criteria used by the authors in classifying lepromatous leprosy is not very clear.] *Ernest Muir*

Contreras, F., Tarabini, J. & Contreras, F., Jr. Acción lepromino-positivizante del BCG intradérmico en hansenianos. (Estudio clínico e histológico.) [**Clinical and Histological Study of the Production of a Positive Lepromin Reaction in Leprosy Patients by Means of Intradermal BCG**] *Rev. Fontilles.* Alicante. 1958, July–Dec., v. 4, No. 6, 469–80, 14 figs. on 4 pls. [25 refs.]

Melamed, A. J. & Jonquieres, E. D. L. Factores que modifican la actividad de los capilares en la reacción leprosa: sugestiones para la terapéutica dermatológica. [**Factors which modify Capillary Action during Lepra Reaction: Suggestions for Dermatological Treatment**] *Semana Méd.* 1959, Mar. 19, v. 114, No. 12, 370–76, 6 figs. & 6 diagrams. English summary.

The authors have found that when certain hormones (corticotrophin and glucocorticoids) and certain derivatives of pyrazol (phenylbutazone and Irgapyrin) are given for a long time in lepromatous leprosy to suppress lepra reaction, and are then stopped suddenly, the result may be to cause an acute inflammation of the capillaries in the lepromatous lesions with resulting necrosis of the leproma followed by healing. Photographs are shown of cases in which lesions have healed up in this way leaving only scars, as if surgical extirpation had taken place. *Ernest Muir*

Tarabini C., G. & Hernández, V. La Triamcinolona en el tratamiento de las leprorreacciones. [**Triamcinolone in the Treatment of Lepra Reaction**] *Rev. Fontilles.* Alicante. 1958, July–Dec., v. 4, No. 6, 481–8. English summary.

The authors noticed that in most female leprosy patients suffering from repeated lepra reactions, these are related to the menstrual cycle, and disappear when the climacteric occurs, whether naturally or through surgical interference. 4 cases are described in which the use of Triamcinolone brought down the temperature and gave relief. It also led to dehydration through sweating and a fall of blood pressure without serious consequences.

The dosage of Triamcinolone (Trialone, Alter) recommended is 8 to 20 mgm. daily, repeated on 3 or 4 occasions, and then gradually reduced (2 mgm. every 3 days) to the minimum of 2 to 15 mgm. *Ernest Muir*

Trop. & Geograph. Med. Amsterdam. 1959, Mar., v. 11, No. 1, 4–12. **Treatment of Leprosy with DDS.** [Report of the Rotterdam Leprosy Study Group, edited by E. H. Hermans, Sr.]

Doull, J. A., Rodriguez, J. N., Davison, A. R., Tolentino, J. G. & Fernandez, J. V. **Clinical Evaluation Studies in Lepromatous Leprosy. Third Series: Nicotinamide, and BCG Vaccination as Supplements to Diaminodiphenyl Sulfone (DDS).** *Internat. J. Leprosy.* New Orleans. 1958, July–Sept., v. 26, No. 3, 219–35. [10 refs.]

In this study the progress made by lepromatous patients on DDS alone is compared with that made by patients treated with DDS and nicotinamide; patients with a negative tuberculin reaction were divided into 2 groups, one group being given BCG at least once in addition to DDS and nicotinamide. The trial was made at two leprosaria in the Philippines and at one in the Union of South Africa. The trial was continued for 48 weeks.

Patients on DDS alone improved just as much as those on the combined treatment. The question of the benefit or otherwise of erythema nodosum leprosum was considered; it was shown that there was more improvement when it was absent, but a further study of this matter is recommended. It was found that the recorded improvement was greater for the more advanced stages of leprosy (L-2 and L-3) than for the less advanced (L-1). During this term of treatment the bacteriological improvement in some of the studies was more marked in the nasal septum than in the skin.

[For previous series, see this *Bulletin,* 1955, v. 52, 1097; 1958, v. 55, 1128.] *Ernest Muir*

Chatterjee, K. R. **Experimental Transmission of Human Leprosy Infection to a Selected, Laboratory-Bred Hybrid Black Mouse.** *Internat. J. Leprosy.* New Orleans. 1958, July–Sept., v. 26, No. 3, 195–204, 12 figs. on 2 pls.

Hybrid black mice were bred by crossing male Indian house mice with female Swiss white mice. Mice of various colours were produced, but the black ones

were selected for the purpose of the experiment, animals of between 10 and 15 days being used. Inoculum was obtained from lesions of active untreated lepromatous cases of leprosy, and was made free from tissue debris by differential centrifugalization, and diluted with saline to contain a known number of bacilli per cc. Inoculation was made only once and was generally either subcutaneous or intraperitoneal or a combination of the two. The dose when the inoculum was taken from a human source was 1,000 million bacilli, but for passage from animal to animal it was 1 to 20 million only. Animals which died or were killed within 5 months of inoculation showed practically no sign of infection, so that a rule was made to kill them at the end of 6 months and then at monthly intervals. Where there was definite sign of multiplication, tests were made to rule out the possibility of contamination with tubercle or saprophytic acid-fast bacilli. Skin tests were made in lepromatous and non-lepromatous leprosy patients, with bacilli from the mice, and these were compared with similar skin tests in which the usual Dharmendra-type antigen was used, so as to exclude the possibility of infection with rat leprosy bacilli. In all, 100 animals were inoculated and observed.

Evidence of infection generally began to show at the end of the 6th or 7th month, the heaviest infections being at the end of 1 year or more. In the spleen, lymph nodes, liver, kidney, omentum, testis, ovary, skin and peripheral nerves the tissues were found crammed with acid-fast bacilli. The infection has so far been carried up to the third serial animal passage.

It is concluded that by using tissue-free bacilli from untreated lepromatous leprosy subjects, and inoculating them in this strain of hybrid black mice, human leprosy has been successfully transmitted and established by passaging. [The massive infection shown in the plates leaves no doubt as to a massive multiplication of bacilli.]

[For a preliminary study, see this *Bulletin,* 1958, v. 55, 1239.]

Ernest Muir

SUSHIDA, K., HIRANO, N. & OCHIAI, Y. **Paper Electrophoretic Analysis of Sera from Leprous Mice treated with INH and its Derivatives.** *Yokohama Med. Bull.* 1959, Feb., v. 10, No. 1, 11–19. [24 refs.]

"Suppressive and curative studies using INH and its derivatives were conducted with experimentally infected murine leprosy mice. Derivatives No. 253, No. 254, No. 282 and No. 284 showed marked suppressive and therapeutic effects. The effect of these chemicals on the serum protein fractions was examined by paper electrophoresis to obtain the following results:

"1. In the experimentally infected untreated mice, the albumin is reduced, beta-globulin is markedly increased and gamma-globulin is almost unchanged as compared to the normal control.

"2. The serum protein of the treated mice in the suppressive experiment differs little from that of the normal control. A reduction in albumin and rise in beta-globulin was observed in the treated mice used in the curative experiment but the rise in the beta-globulin was smaller than that of the untreated animal.

"3. The changes in the serum protein were unrelated to the kind of drugs administered.

"4. There was no relationship between the changes in the serum protein of

the animals which had been medicated and the number of leprosy bacilli found at the site of inoculation."

[See this *Bulletin*, 1959, v. 56, 56.]

HELMINTHIASIS

In this section abstracts are arranged as far as possible in the following order:—TREMATODES (*schistosomes, other flukes*); CESTODES (*Diphyllobothrium, Taenia, Echinococcus, other cestodes*); NEMATODES (*Hookworms, Ascaris, Filarial worms, Dracunculus, etc., Trichuris, Enterobius, Trichinella, etc.*).

BONETTI, F. Sulla diffusione di parassiti intestinali nel Comune di Brescia. [**Incidence of Intestinal Parasites in the Brescia Area**] *Giorn. di Malattie Infettive e Parassit.* 1959, Feb., v. 11, No. 2, 130–32. [19 refs.]

The following is a translation of the author's summary:—

The author records the incidence of intestinal parasitic infection in the Brescia area derived from surveys in 1940 and 1955–56. Altogether 1,846 subjects were examined and the average percentage of infection was 76%. The commonest parasite was *Trichuris trichiura* (56%), followed in descending order by *Ascaris lumbricoides* (43%), *Ancylostoma duodenale* (15%), *Hymenolepis nana* (1%) and *Strongyloides stercoralis* (0·3%). The most frequent associations were that of *A. lumbricoides* and *T. trichiura* (29%) and *A. duodenale, A. lumbricoides* and *T. trichiura* (5%).

After observations on epidemiology and sanitation, the author draws attention to the need for intensifying the campaign against intestinal parasites.

H. J. O'D. Burke-Gaffney

ZANUTTINI, G. & GALLIERA, A. Indagine sulla frequenza delle elmintiasi intestinali tra i degenti dell'Ospedale Civile di Udine. [**Survey of Intestinal Helminths in In-Patients in the Civil Hospital, Udine**] *Giorn. di Malattie Infettive e Parassit.* 1959, Jan., v. 11, No. 1, 51–4, 1 graph.

The following is a translation of the authors' summary:—

The authors record results of stool examinations for helminths carried out in the pathological laboratory of the Civil Hospital, Udine, in 1956–1957. 58% were positive: of these 1·25% were *Taenia solium* and *Taenia saginata*, 1·85% *Enterobius vermicularis*, 33·2% *Ascaris lumbricoides*, and 63·7% *Trichuris trichiura*. Hookworms and other common helminths were not found. The percentages of each group are shown by age. The survey, which was carried out principally among in-patients, gives a reasonably clear picture of the incidence of helminthiasis in Friuli.

Finally, findings are given for a similar study on 220 patients in a mental institution. *Trichuris trichiura* was found in 95% of the patients and in 10% it was associated with *Ascaris lumbricoides*. *H. J. O'D. Burke-Gaffney*

Maldonado Sampedro, M. Estudio comparativo de los procedimientos de concentración y recuento de huevos en técnica coprológica, con inclusión de un método personal. Su valor epidemiológico. [**Comparative Study of Procedures for the Concentration and Enumeration of Ova in the Faeces, with a Description of a Personal Method, and its Epidemiological Value**] *Rev. Sanidad e Hig. Pública.* Madrid. 1958, Sept.–Oct., v. 32, Nos. 9/10, 426–61, 5 figs. (4 on 2 pls.) [27 refs.]

After a long discussion of the literature on various concentration methods and their possible sources of error, especially in enumeration, the author describes his own method.

This is a double concentration method, of flotation and centrifugation, using 5–10 gm. amounts of faeces triturated in saturated saline and placed in a glass beaker up to a certain mark. The emulsion is then covered with a slide, the under surface of which just touches the liquid, and the whole is left for 15–20 minutes. The slide with its adhering ova is then carefully lifted off and the remainder centrifuged at 1800 *g* for 2–3 minutes, after addition of 4 to 5 cc. ether. The deposit is then examined.

Advantages claimed for this method are that it does not require special apparatus and so can also be used in the field; that it offers the advantages of both flotation and centrifugation methods; that it uses a much larger quantity of faeces than other methods and hence is more accurate; and finally, that it can also be used for the detection of protozoal cysts. *W. K. Dunscombe*

Cavier, R. Quelques récents travaux dans le domaine des anthelminthiques. [**Some Recent Studies on Anthelmintics**] *Méd. Afrique Noire.* Dakar. 1959, Mar. 16–31, v. 6, No. 6, 133–44. [188 refs.]

A general review and discussion.

Purser, J. R. **Some Observations on the Problem of Urinary Schistosomiasis Control in Adamawa Province, Northern Nigeria.** *West African Med J.* 1959, Apr., v. 8 (n.s.), No. 2, 81–3.

In two villages near Yola, Nigeria, known to be heavily infected with urinary schistosomiasis, infected schoolchildren were treated with Fantorin [stibophen], the course given to each child being 11 cc. intramuscularly over 3 days. This was smaller than the recommended course owing to the author's lack of trained staff while engrossed with other duties. At the same time, copper sulphate was applied to all neighbouring pools and swamps in gauze bags, each holding 3 or 4 ounces, suspended just beneath the water surface on floating sticks and anchored by stones on the bottom. [This sounds simple and effective to the point of genius.] Sulphation was carried out 3 times at monthly intervals, and large numbers of dead snails were noted. Afterwards all pools and swamps dried up. *Bulinus* (*Physopsis*) *globosus* and a *Lanistes* species were the snails identified. When the pools refilled at the beginning of the next rains, *Bulinus* (*P.*) *globosus* was again plentiful.

The aim of the experiment was to see whether children could be cured and prevented from becoming reinfected, but after a year those re-examined (52 out of the original 115) actually showed an infection rate higher than the original one. This disappointing result was thought to be due to inadequate Fantorin

dosage rather than to cure and reinfection, but the figures were inconclusive for various reasons. *B. B. Waddy*

TIMMS, A. R. & BUEDING, E. **Studies of a Proteolytic Enzyme from** *Schistosoma mansoni*. *Brit. J. Pharmacol. & Chemotherapy*. 1959, Mar., v. 14, No. 1, 68–73, 4 figs. [13 refs.]

Because of its habitat *Schistosoma mansoni* is dependent on the blood components of the host for nutrition. A study of the amino-acids required by this parasite might give a lead to synthesis of effective chemotherapeutic agents and the present studies on a proteolytic enzyme of the parasite were undertaken with this in view. The schistosomes were maintained in a modified buffered synthetic medium previously described [this *Bulletin*, 1950, v. 47, 633] in which worms remained alive up to 9 days, and up to 3 days if amino-acids were omitted. The medium first described contained 11 and the present medium 17 amino-acids, the latter corresponding to the amino-acids of globin. Adult parasites were obtained from the veins of mice infected 6 to 8 weeks earlier with cercariae. Proteolytic activity was present in a homogenate of worms prepared at zero temperature. An enzyme of more constant potency was obtained as an acetone-dried powder and it remained stable for about 2 weeks around zero. The substrate used was a previously dialysed 2·5% solution of bovine haemoglobin. Proteolytic activity was generally measured in a malate buffer at *p*H 3·8 over a period of 30 to 90 min. The degree of enzyme activity was determined from the amino-acid content of the mixture after removal of protein.

The best survival of the schistosomes was obtained in the amino-acid mixture which corresponded to globin in composition, and suggests that this substance may be the chief source of amino-acids *in vivo*. Haemoglobin was optimally digested by the enzyme preparation at *p*H 3·9 and the enzyme from female parasites was more active than that from males. It was present in the supernatant of extracts after ultra-centrifugation and a 20-fold purification was obtained by this means. It had a marked specificity for haemoglobin and did not hydrolyse serum proteins to any extent. *J. D. Fulton*

EVANS, A. S. & STIREWALT, M. A. **Serologic Reactions in** *Schistosoma mansoni* **Infections. V. Localization of CHR and Cercarial Agglutinating Factors in Electrochromatographically Fractionated Human Sera.** *Exper. Parasit.* New York. 1959, Feb., v. 8, No. 1, 1–9, 6 figs.

Continuous flow paper electrophoresis, where a protein descends on a curtain of filter paper across which an electric current is applied, allows a very detailed separation in numerous fractions. This method has been used to examine sera from 28 human cases of *Schistosoma mansoni* infection and 20 control sera. The serum was sub-divided into fractions and, subsequently, each of the fractions was examined for cercarial agglutinating reactivity and also *in vitro* for pericercarial envelope forming (CHR) activity. The active principle was eventually isolated in a single fraction which was electrophoretically homogeneous, and which formed part of the gamma globulin.

The fraction was then examined for its amino-acid composition. Hydrolysates were submitted to chromatography, and it was found that there was

some difference in the distribution of amino-acids in this fraction when it was compared with that prepared from normal sera. In particular, leucine, isoleucine and methionine were low in concentration, and aspartic and glutamic acid were high. Ultra-centrifugation showed that this protein could yet be divided into three components, of which two minor components were relatively fast-sedimenting, and one major, which was slow-sedimenting. The CHR factor and the cercarial agglutinating activity were found only in the major fraction.

[For abstracts of earlier papers in this series, see this *Bulletin,* 1955, v. 52, 993 ; 1956, v. 53, 614 ; 1957, v. 54, 839.] *H. Lehmann*

Ladosky, W. O comportamento do pancreas na esquistossomose mansonica hepato-esplenica. Estudo comparativo com o comportamento do mesmo orgão na cirrose de Morgagni-Laennec. [**The Pancreas in Hepato-Splenic Schistosomiasis. Comparative Study with the Changes in the Pancreas in Laennec's Cirrhosis**] Reprinted from *Rev. Assoc. Med. Brasil.* 1958, June, v. 4, No. 2, 141–50, 5 figs. [17 refs.] English summary.

The author, from Belo Horizonte, Brazil, compared the connective tissue changes in the pancreas in hepatosplenic schistosomiasis with those occurring in Laennec's cirrhosis. The degree of fibrosis found was classified arbitrarily from 0 to + + + and the changes in interlobular and interacinous connective tissue were recorded separately. Tissue sections were studied from 19 cases of hepatosplenic schistosomiasis and 14 of Laennec's cirrhosis. Details are given of the findings for all 33 cases and the results are analysed in 6 tables. 5 photomicrographs show the histological changes in 2 cases of schistosomiasis and one of Laennec's cirrhosis. *Schistosoma mansoni* eggs or granulomata were found in 9 of the 19 cases of schistosomiasis. The results are discussed in relation to the findings of previous workers [see, for example, this *Bulletin,* 1933, v. 30, 208 ; 1942, v. 39, 563 ; 1953, v. 50, 824].

The author concludes that in schistosomiasis fibrosis is predominant in the interlobular connective tissue of the pancreas and less so in the interacinous. It does not alter the general architecture of the organ. In cirrhosis, both forms of connective tissue are involved and fibrosis is distributed homogeneously, at times insulating lobes or parts of lobes and causing compression hypotrophy. This diffuse interstitial pancreatitis distorts the glandular architecture.

In view of these frank differences the author does not think that the changes are solely the result of portal hypertension, which is common to both diseases, but probably result from other factors related to the initial diseases themselves.

H. J. O'D. Burke-Gaffney

Bandeira, V. & Carvalho, A. Presença de exemplares adultos de *Schistosoma mansoni* em veias do plexo esofágico. [**Adult** *Schistosoma mansoni* **Worms in Veins of the Oesophageal Plexus**] *Anais Facul. Med. Univ. do Recife.* 1958, June, v. 18, No. 1, v–vi, 17–19, 3 figs. on 2 pls.

The English summary appended to the paper is as follows :—

" The writers report a case of mansonian schistosomiasis with portal hypertension and esophageal varicosities. The histological sections taken from the oesophagus showed several adult specimens of S. mansoni, inside veins of the

esophageal plexus. Two granulomatous lesions around eggs of the parasite were also found in the muscular and adventitial coats of the oesophagus.

"This is the second case reported in the literature of schistosomatic lesions in the human oesophagus."

[See also this *Bulletin*, 1958, v. 55, 180.]

SOMERS, G. F. & WHITTET, T. D. **Sodium and Potassium Antimonyl Tartrate Injections. Effects of Sterilisation and Storage on Toxicity.** *West African Pharmacist.* London. 1959, Mar., v. 1, No. 1, 15–17. [13 refs.] [Reprinted from *Pharmaceut. J.* 1958, Dec. 28.]

Intravenous injections of sodium or potassium antimonyl tartrate frequently cause unpleasant side-reactions and occasionally cause death. If the patient dies, the drug may be suspected; the stability of solutions of antimonyl tartrates has been questioned and pharmacopoeias are not unanimous in their instructions for preparing solutions for injection. After a fatality at the Tropical Diseases Hospital, London, the authors investigated the toxicity of solutions of sodium and potassium antimonyl tartrates prepared from drugs of BP [British Pharmacopoeia] standard in water for injection and distributed into ampoules or rubber-capped bottles. The solutions were sterilized by autoclaving at 115°C. for 39 minutes, by steaming for 30 minutes or by filtration through 5/3 bacteria-proof sintered glass. Some of the samples were stored at 4°C., at room temperature (15°–24°C.) or at 40°C. and examined 3 months and 12 months later. Solutions which had been autoclaved or steamed were pale yellow in colour but no opalescence occurred in any sample.

The median lethal dose (LD50) of each sample was determined by injection into mice and the limits of error calculated. There were no significant differences in the toxicities of solutions subjected to any of the sterilization and storage procedures. Discoloration was prevented without change in toxicity by the addition of 0·1% of sodium metabisulphite. Solutions preserved with 0·1% of ascorbic acid were also unchanged in toxicity after storage for 3 months; sodium edetate was incompatible with antimonyl tartrates.

The results show that injections of sodium and potassium antimonyl tartrates can be safely sterilized by autoclaving, steaming or filtration without increasing their toxicity. *L. G. Goodwin*

OLIVER-GONZÁLEZ, J. & FERGUSON, F. F. **Probable Biological Control of Schistosomiasis mansoni in a Puerto Rican Watershed.** *Amer. J. Trop. Med. & Hyg.* 1959, Jan., v. 8, No. 1, 56–9, 2 figs.

Since 1933 [this *Bulletin*, 1934, v. 31, 381] the Los Peña community in Puerto Rico has been the subject of intermittent studies relating to incidence of schistosomiasis and of prevalence and infection rates in the snail population. Over a period of 6 years from 1947 to 1953 [*ibid.*, 1951, v. 48, 54] considerable efforts were made to control the disease by mass treatment, improvement of water supplies and sanitary conditions, health education, therapy and a limited molluscicidal programme. The use of sodium pentachlorophenate in the main stream of this drainage area produced only temporary reduction in the incidence of *Australorbis glabratus* [*ibid.*, 1951, v. 48, 53]. These efforts resulted in partial control. The prevalence of schistosomiasis dropped from 44·6% in

1947 to 4·5% in 1949 but had increased to 29·2% in 1953 when the control programme had ceased.

Marisa cornuarietis, the large ampullarid S. American watersnail, was first seen in 1952 [*ibid.,* 1956, v. 53, 1444] in the downstream section of the area and in the succeeding 4 years the upstream advance of this species was accompanied by a marked fall in the incidence of *A. glabratus.* Since 1956 to late 1957, *Marisa* was deliberately introduced to all sections of the drainage area as a possible means of biological control of the indigenous vector snail. In 1956 and 1957 sampling for incidence of infection among families living close to the stream was concentrated mainly among children up to 10 years old. The incidence of infection in juveniles showed no increase from 1956 to 1957. Freedom from infection of all children under 5 years old suggests that the stream is not now a focus of infection. The introduction of *Marisa* probably provides a positive step forward in control of schistosomiasis through strong biological competition with *A. glabratus,* the indigenous vector snail.

O. D. Standen

MALDONADO, J. F. **The Longevity of the Unhatched Miracidium of *Schistosoma mansoni* in the Tissues of Mice.** *Amer. J. Trop. Med. & Hyg.* 1959, Jan., v. 8, No. 1, 16–19, 1 fig. [11 refs.]

Mice infected with *Schistosoma mansoni* two months previously were treated with tri-(n-dodecylmercapto)-s-antimonious acid at 225 mgm./kgm. intraperitoneally daily for 2 days to kill the adult worms. Assessment of viability of the eggs contained in the liver and tissues of the intestine was made at intervals up to 35 days from the first post-treatment day. In all, 79 mice were examined. Differential counts of living and dead eggs were made by microscopical examination of glass slide tissue crushes. The criteria for determination of death of the egg were deformity of the miracidium, vacuolization, absence of active flame cells, absence of outline to the miracidium, loss of movement and loss of turgidity. Hatching tests were also used.

Examination of worms recovered showed that degeneration of the ovary and suppression of egg production occurred as early as 3 days after treatment commenced. In 7 untreated mice examined 2 months after infection 21·4% of the eggs were dead. In the treated mice the percentage mortality remained at about this level for 6 to 12 days, after which the proportion of live eggs gradually decreased until none could be found at 33 days. Some egg hatches were made as late as the 26th day (intestine) and the 23rd day (liver) but the miracidia were abnormal.

Study of the eggs deposited in the tissues indicated that they had been laid in a fully embryonated form and not in an immature condition as is accepted generally. As degeneration progressed the egg lost colour, became increasingly granular in appearance, the miracidium decreased in size, flame cell movement slowed down, the egg became smaller with loss of turgidity and the miracidium was finally reduced to a granular residue. *O. D. Standen*

WINKLER, L. R. & WAGNER, E. D. **A Method of comparing Geographically Distant Snail Populations by Study of their Shell Composition.** *Amer. J. Trop. Med. & Hyg.* 1959, Jan., v. 8, No. 1, 13–15.

The organic constituents of the shells of wild *Oncomelania nosophora* collected in Japan were compared with those of laboratory bred specimens of

the same species. The soft parts of dead snails were allowed to rot and the shells were decalcified with hydrochloric acid. The weights of the residual organic shells were compared after decalcification; nitrogen, sulphur and amino-acid determinations were made by chemical and biochemical analytical methods. It was estimated that the shells of the wild snails contained twice as much organic material as those of the laboratory bred specimens and that considerably more nitrogen and amino-acids were present.

It was concluded that the practice of feeding laboratory snail cultures on filter paper could result in abnormalities through nutritional deficiency in nitrogenous material. *O. D. Standen*

WALTON, B. C., WINN, M. M. & WILLIAMS, J. E. **Development of Resistance to Molluscicides in** *Oncomelania nosophora*. *Amer. J. Trop. Med. & Hyg.* 1958, Nov., v. 7, No. 6, 618–19.

"Immersion tests were conducted with *O. nosophora* collected from areas treated for several years with sodium pentachlorophenate and dinitro-o-cyclohexylphenol, and from neighbouring control areas, to determine if resistance has developed to these molluscicides in the treated snail populations. No resistance to Na-PCP was demonstrated in snails from areas which had been treated for 7 years, and 4 years, respectively. However, there was a marked degree of resistance to dinitro-o-cyclohexylphenol in snails from a locality which had been treated with DN-1 for 6 years."

SADUN, E. H., BUCK, A. A. & WALTON, B. C. **The Use of Purified Antigens in the Immunodiagnosis of Paragonimiasis in Humans and Experimental Animals.** [Abstract.] *J. Parasitology*. 1958, Aug., v. 44, No. 4, Sect. 2, 17.

3 antigens were prepared from adult *Paragonimus westermani*: (a) a relatively crude ether extraction [PC], (b) a purified acid-soluble protein fraction [PM] and (c) a purified acid-insoluble, alkali-soluble protein fraction [PM-INS].

PM was used as antigen in intradermal tests on 2,000 volunteers. All those with proved paragonimiasis were positive, but only 1 of 121 uninfected controls. Cross-reactions sometimes occurred with patients having schistosomiasis or clonorchiasis, but the wheal produced by the homologous antigen was always much larger and clearer.

Complement-fixation tests were done at intervals on cats infected with a single dose of metacercariae. The best results were obtained with PM-INS. All sera from the cats before infection and from uninfected controls were negative. Positive results were obtained with the sera of infected cats after about 30 days and the sera were still positive after 130 days. Eggs first appeared in the stools 60 to 70 days after infection.

Complement-fixation and intradermal tests were compared in 162 persons. Negative complement-fixation tests were obtained in 9% of patients with active infections, but no positives were obtained in those whose intradermal tests were negative. No cross-reactions were obtained with this antigen in complement-fixation tests on sera from patients having clonorchiasis or schistosomiasis and a variety of fungous, bacterial and granulomatous conditions, which are listed.

H. J. O'D. Burke-Gaffney

SADUN, E. H., BUCK, A. A., LEE, B. K., MOON, C. H. & BURKE, J. C. **Epidemiologic Studies for Paragonimiasis and Clonorchiasis by the Use of Intradermal Tests.** *Amer. J. Hyg.* 1959, Jan., v. 69, No. 1, 68–77, 4 figs. [10 refs.]

Intradermal tests for the diagnosis of *Paragonimus* and *Clonorchis* infections have been described [see *Abstracts of the Ninth Pacific Science Congress, Bangkok, Thailand, 1957,* p. 207; this *Bulletin* (above); SADUN *et al., Amer. J. Trop. Med. & Hyg.,* 1959, v. 8 (in press); SADUN *et al., Amer. J. Parasit.,* 1959, v. 45 (in press)].

The practice of using such intradermal tests was investigated in two provinces in South Korea—in an island Cheju Do, in which paragonimiasis occurs alone, and in Kyong Sang in the south-east corner of the mainland where clonorchiasis and paragonimiasis occur together.

Limited cross-reactions occur between paragonimiasis and clonorchiasis with purified antigens (see SADUN *et al., loc. cit.*) and the larger wheal therefore was taken to indicate the parasite with which the patient was infected. To test the validity of this assumption 228 persons with proven paragonimiasis and 138 with proven *Clonorchis sinensis* infections were tested with both antigens. All of those with paragonimiasis gave a positive reaction and 3% with clonorchiasis were negative. Some infections due to clonorchiasis and some double infections might therefore have been missed.

Intradermal reactions were done on 1,367 people on Cheju Do island; 642 were positive for *P. westermani* and in 265 eggs were found in the sputum. 1,320 persons in Kyong Sang Province were examined for intradermal reactions; although dermal reactors to *P. westermani* were found in every area examined the percentage varied greatly from 1 to 18, and the percentage of reactors to *C. sinensis* varied from 7 to 61.

The results were related to the presence of the intermediate host and it is concluded that intradermal tests can be used to a great advantage in epidemiological investigations, though occasional sputum and stool examinations should be done to confirm the presence of paragonimiasis and clonorchiasis, since if these infections are not found in the presence of positive reactors infection with a closely related trematode should be suspected. *W. E. Kershaw*

NAGANO, A., TAKEUCHI, M., SEKI, J., TAKESHITA, Y., KURAKATA, T. & OHTSUKA, T. Über einen Fall von eosinophilem Leukämoid bei Paragonimiasis cerebri. [**A Case of Eosinophilic Leukaemia in Cerebral Paragonimiasis**] *Yokohama Med. Bull.* 1959, Feb., v. 10, No. 1, 60–67, 3 figs.

WYKOFF, D. E. **Studies on *Clonorchis sinensis*. IV. Production of Eggs in Experimentally Infected Rabbits.** *J. Parasitology.* 1959, Feb., v. 45, No. 1, 91–4, 1 fig.

"Egg-production by *Clonorchis sinensis* in 7 rabbits was followed by a dilution egg-counting technic for periods up to 55 weeks after inoculation of metacercariae. The numbers of eggs increased steadily up to the 17th week and thereafter showed cyclic variation with maxima at roughly 10-week intervals. The mean number of eggs per worm per day, based on counts made

during the week of death in 16 animals, was approximately 4,000 and the mean number of eggs per gram of feces per worm was approximately 100."

[See this *Bulletin*, 1958, v. 55, 554.]

COUDERT, J. & TRIOZON, F. Recherche sur l'épidémiologie de la distomatose humaine à *Fasciola hepatica*. A propos d'une épidémie récente. [**Study of the Epidemiology of *Fasciola hepatica* Infection in Man, in Relation to a Recent Outbreak**] *Rev. d'Hyg. et de Méd. Sociale*. Paris. 1958, Dec., v. 6, No. 8, 840–64, 1 map. [32 refs.]

The authors' summary in French is freely translated as follows:—

Hepatic distomatosis has been regarded up to recent years as an exceptional disease in Western Europe, limited to sheep-rearing regions and dependent on the consumption of wild watercress.

A recent and severe outbreak affecting about 500 people in the region north of Lyons showed that the disease occurs essentially in regions where cattle are reared and heavily infected and where wild and semi-cultivated watercress is eaten.

The symptoms most often encountered are pains in the hepatic region (66% of people); asthenia (62%); wasting (52%); and fever (45%). Hepatomegaly was seen in only 30% of patients, but allergic pulmonary manifestations (spasms of coughing, influenza-like attacks, Loeffler's syndrome) were very frequent (37%). Systematic enquiries have shown us that a clinically asymptomatic form of the infection is much more frequent than was realized up to now.

Hypereosinophilia is the best warning symptom, its development following Lavier's curve. The intradermal test, carried out with a lyophilized antigen, was shown to be an extremely simple, rapid and early diagnostic method. Finding the eggs in the stools (or bile) is the only way to determine the species of fluke involved; a positive result can only be obtained three months after infection and for it a concentration technique of some kind is necessary.

Emetine still remains the best drug for the infection, especially in the early stages; in more than half the patients a course of two injections was required to produce a cure.

To avoid new epidemics in the future it is stressed that the authorities should issue to the public the necessary precautions to be taken. *J. J. C. Buckley*

WEBSTER, Gloria A. & CAMERON, T. W. M. **On an Unusual Fish Tapeworm from Man.** *Canadian J. Zool.* 1959, Apr., v. 37, No. 2, 211–12, 4 figs. on pl.

"An abnormal specimen of *Dibothriocephalus* from a boy in Saskatchewan has segments much longer than broad, as well as a few abnormal triangular ones. It is suggested that this may be the result of anthelmintic action or the physiological condition of the host."

GIBSON, T. E. **The Identification of *Cysticercus bovis*, with special reference to Degenerate Cysticerci.** *Ann. Trop. Med. & Parasit.* 1959, Apr., v. 53, No. 1, 25–6, 2 figs. on pl.

"1. A survey of the cysts encountered in routine meat inspection, which macroscopically appeared to be *Cysticercus bovis*, revealed that only 25 per

cent. were viable *C. bovis*. Four per cent. were shown not to be *C. bovis*, and the remaining 71 per cent. were either caseous or calcified.

" 2. Histological examination of 18 caseous and calcified cysts revealed the presence of cestode tissue in only three of them. This proportion is too small to justify the use of histological methods as a routine measure.

" 3. The difficulties for the meat inspector which these findings create are briefly discussed."

MACÍAS, V. & MAQUEO, M. Cisticercosis cerebral. **[Cerebral Cysticercosis]** *Rev. Invest. Clin.* 1958, Oct.–Dec., v. 10, No. 4, 443–54, 4 figs. on 4 pls. [10 refs.]

The English summary appended to the paper is as follows:—

" 1. A careful survey of the literature on cerebral cysticercosis is presented.

" 2. Twenty-five case histories were reviewed and in each were examined the neurologic symptoms, the clinical diagnosis which was made and the autopsy findings in the cranial vault.

" 3. Brief summaries of the clinical history of the more representative cases are included.

" 4. Emphasis was made that the primary object of this article is to call attention to the frequent occurrence of this disease in Mexico."

DONOSO, F. & DONCKASTER, R. Contribución al estudio de la *Hymenolepis nana*. III. Ensayo terapéutico con Ditiazanina (3-3′ dietilcarbocianina). **[Contribution to the Study of *Hymenolepis nana*. III. Therapeutic Trial with " Dithiazanine "]** *Bol. Chileno de Parasit.* 1958, Oct.–Dec., v. 13, No. 4, 73–5. [11 refs.]

The English summary appended to the paper is as follows:—

" 1.—15 *Hymenolepis nana* infected patients of both sexes, ranging from 26 months to 32 years of age, were treated with Dithiazanine.

" 2.—400 to 600 mg. of the drug were daily administered to 12 patients during 14 days and to 3 for 7 days.

" 3.—Fair tolerance to the drug was observed in 5 cases and bad in the remaining 10 patients. The main intolerance manifestations were vomitus, asthenia, and anorexia.

" 4.—Only two patients became negative after treatment, a fact which indicates that Dithiazanine was not effective in the treatment of *Hymenolepis nana* infection under our conditions in the reported cases."

SCHILLER, E. L. **Experimental Studies on Morphological Variation in the Cestode Genus *Hymenolepis*. 1. Morphology and Development of the Cysticercoid of *H. nana* in *Tribolium confusum*.** *Exper. Parasit.* New York. 1959, Apr., v. 8, No. 2, 91–118, 17 figs. on 4 pls. [38 refs.]

GARABEDIAN, G. A., MATOSSIAN, R. M. & SUIDAN, F. G. **A Correlative Study of Immunological Tests for the Diagnosis of Hydatid Disease.** *Amer. J. Trop. Med. & Hyg.* 1959, Jan., v. 8, No. 1, 67–71. [13 refs.]

Complement-fixation tests, indirect haemagglutination [this *Bulletin*, 1957, v. 54, 1335] and intradermal tests were done on the sera from 79 patients with hydatid disease, confirmed surgically, and from 105 patients with miscellaneous conditions not suspected of having hydatid disease, and in whom the various diagnoses were established by surgical intervention or by clinical and laboratory studies. Of the verified patients, 61 gave positive complement-fixation tests, 70 gave positive intradermal tests, and 69 gave positive indirect haemagglutination tests; and of the patients not suffering with hydatid disease, 6 gave positive complement-fixation tests, none a positive indirect haemagglutination test and 19 a positive intradermal test. *W. E. Kershaw*

NORMAN, Lois, SADUN, E. H. & ALLAIN, D. S. **A Bentonite Flocculation Test for the Diagnosis of Hydatid Disease in Man and Animals.** *Amer. J. Trop. Med. & Hyg.* 1959, Jan., v. 8, No. 1, 46–50.

The bentonite flocculation (BF) test used in trichiniasis [see this *Bulletin*, 1952, v. 49, 431] has been adapted for the diagnosis of *Echinococcus* infection. Antigen is adsorbed on standard-sized bentonite particles, which are added to serial dilutions of serum on a wax-ring slide. Aggregation of more than half of the particles is considered positive.

Antigen was made from hydatid fluid from pig, human and horse hydatid cysts and from hydatid sand from pig cysts. The results of the BF test were compared with complement-fixation tests (CF), the same antigen being used.

Human sera were tested from 413 cases referred to the laboratory for the diagnosis of *Echinococcus* infection, and from 145 people ill with other infections. 18 of the former were verified surgically. Some 4,000 other specimens were collected in surveys on 6 American Indian reservations in the United States and from Eskimos and military personnel stationed in Alaska, and from healthy Army and Air Force men in the United States.

All 18 proved cases were positive by BF tests with titres ranging from 1 in 10 to 1 in 2,560 and only 7 were positive by CF with a titre range of 1 in 4 to 1 in 128. 12·1% of the United States Indians in 5 of the reservations were positive by BF tests, and 3% positive by CF tests.

Over 1,700 sera were collected from 12 species of wild animals trapped in Georgia and Florida and only 4% were positive by BF and 0·4% by CF. This is regarded as unexpectedly low since cross-reactions with animal helminth infections were anticipated. Most of the positive sera came from bobcats, foxes, rabbits and raccoons. *W. E. Kershaw*

KAGAN, I. G., ALLAIN, Dorothy S. & NORMAN, Lois. **An Evaluation of the Hemagglutination and Flocculation Tests in the Diagnosis of *Echinococcus* Disease.** *Amer. J. Trop. Med. & Hyg.* 1959, Jan., v. 8, No. 1, 51–5. [12 refs.]

Boyden's tannic acid haemagglutination test [this *Bulletin*, 1956, v. 53, 1472; 1957, v. 54, 736, 1335] and the bentonite flocculation test [see NORMAN *et al.*,

above] were compared on sera from 30 clinically diagnosed human cases of *Echinococcus* infection of which 15 from North America and 8 from the Lebanon had been verified surgically; and on 246 sera from patients believed not to suffer from this infection.

Of the verified cases, all gave positive haemagglutination tests, 20 gave positive flocculation tests, and 5 of the North American patients gave positive complement-fixation tests. 3 sera from additional North American patients, from whom cysts had been removed 5 to 10 years earlier, were negative in all tests, and in one patient the haemagglutination titre fell from 1 in 3,200 to 1 in 800 during the month following operation.

The sera of the subjects believed not to be suffering from hydatid disease gave 14·2% positive in the haemagglutination test, 10·1% in the bentonite flocculation test, and the complement-fixation test was negative.

W. E. Kershaw

Ghosh, P. K. **Disseminated Hydatid Disease of Abdomen.** *Calcutta Med. J.* 1959, Feb., v. 56, No. 2, 55–8, 1 fig.

"A case of multiple hydatid cyst of abdomen involving right lobe of the liver, right kidney, right and left ovaries is here described. The case was a problem case for diagnosis. A definite diagnosis could only be made on the operation table."

D'Ambrosio, R., Bruni, F. & Cavalli, V. Pneumotorace spontaneo idatideo. [**Spontaneous Pneumothorax of Hydatid Origin**] *Lotta c. la Tubercolosi.* 1958, Nov.–Dec., v. 28, Nos. 11/12, 1166–88, 16 figs. [34 refs.]

A general account.

Arentsen, J., Pasmanik, S. & Atias, A. Un caso de quiste hidatídico de la órbita. [**Hydatid Cyst of the Orbit: a Clinical Case**] *Bol. Chileno de Parasit.* 1958, Oct.–Dec., v. 13, No. 4, 81–2.

Wang, Cheng-Yi [Compiled by]. **Studies on Ancylostomiasis in New China.** *Chinese Med. J.* Peking. 1959, Mar., v. 78, No. 3, 257–66.

Hookworm infection occurs throughout all of China except a few provinces in the north-west which are too cold and dry. The incidence is highest in the warm south, and in some rural areas and in coal mines it may reach 80 to 90%. Rice culture is not associated with transmission, nor are winter crops, but dry soil crops grown during the summer and autumn—such as sweet potato, corn, tobacco and others—are manured with human nightsoil and hookworm larvae can survive to become infective. Transmission is often seasonal; in cold dry provinces transmission may be limited to a few summer months, while in warm southern regions it may continue almost throughout the year. Methods of treating nightsoil to kill immature hookworm forms were studied. Storage

was effective but had to be prolonged unless human or horse urine was added; this reduced the period to 7 days in summer and 28 days in winter. Ammonia and urea in high concentration in the urine increased its effectiveness.

Aerobic composting proved satisfactory and certain chemicals (derris powder 0·5%, benzene hexachloride wettable powder 1%, calcium cyanamide 0·3 to 0·6%, lime 1 to 2% and urea 1 to 2%) sterilized the nightsoil of ova or larvae.

Routine methods of diagnosis and counting of ova were too expensive for widespread use, so a method of culture of a known quantity of faeces and examination for larvae with a x20 lens 5 days later was found to give results more accurate than salt flotation or Stoll's counting technique. Details of the method are given. Mass treatment is being done on an immense scale, mainly in the winter to minimize reinfection. Tetrachlorethylene is used as a routine without purgation, and toxic effects are treated with acupuncture. A new and less toxic compound, 1-bromo-2-naphthol, 6 gm. on 2 successive days, is given to the weak and sick and is said to cure 61%. Ferrous sulphate 1·8 gm. daily for 8 weeks cures anaemia and increases resistance. Latrines and pits for storing nightsoil have been built in large numbers. Fertilizers of all kinds are used according to the instructions of the cooperative and this reduces transmission. Cheap forms of protective footwear are being used. As a result of these measures the incidence of the worm burden has been greatly reduced and in some areas the infection is almost eradicated.

T. H. Davey

Karandikar, G. K., Salunke, D. S., Patel, M. V. & Luhar, P. M. **Anthelmintic Use of Hydrogen Peroxide. A Preliminary Report.** *Indian J. Med. Sci.* 1959, Feb., v. 13, No. 2, 95–8. [10 refs.]

The authors briefly review earlier papers on the use of hydrogen peroxide as an anthelmintic. They here report on the treatment of 12 out of more than 20 patients treated with it, these 12 patients being predominantly infected with hookworms.

Before treatment each patient was given milk only and the next morning a saline purge. The 24-hour stool thus produced was examined by the Stoll egg-counting method. Next morning the patient was given 300 ml. of a 1% solution of assayed hydrogen peroxide by stomach tube (children receiving 150 ml. of a 0·2% solution) and 2 hours later a saline purge, 24-hour stools being again collected and examined by the Stoll method. On successive days 3 more 24-hour stools, produced without purges, were examined and a final one on the sixth day after a purge. In 4 patients a further stool was examined on the fifteenth day after treatment. Total worm counts were made on these stools.

Tables 1 and 2 give the results. There were no ill effects apart from mild nausea in one child (2 patients were 6 and 8 years old, the ages of the others ranging from 25 to 50). Worms were expelled by all patients, but the egg counts persisted after a significantly high number of worms had been expelled and the authors think that more work is needed before the variations in the post-treatment egg counts can be correctly interpreted. The expulsion of worms is, however, encouraging and they are extending their work to include other "helminthic states" and to compare the efficacy of hydrogen peroxide with that of other anthelmintics.

G. Lapage

CERF, J. Traitement de la strongyloïdose par la dithiazanine. [**Treatment of Strongyloïdiasis with Dithiazanine**] *Ann. Soc. Belge de Méd. Trop.* 1958, Dec. 31, v. 38, No. 6, 1027–9.

The English summary appended to the paper is as follows:—

"A trial on 57 cases of strongyloïdiasis leads the author to the conclusion that dithiazanine iodide, at a dosage of 20 mg/Kg, gives a cure rate of 87% in 3 days, and about 100%, in 4 or 5 days." [See this *Bulletin*, 1958, v. 55, 530.]

HENGGELER, C. Drei Endemien flüchtiger Lungeninfiltrate mit Bluteosinophilie (Löfflersches Syndrom). [**Three Outbreaks of Loeffler's Syndrome**] *Schweiz. med. Woch.* 1959, Apr. 11, v. 89, No. 15, 402–4, 6 figs.

The English summary appended to the paper is as follows:—

"In the present article we describe three outbursts of evanescent pulmonary infiltrates with blood eosinophilia (clinically described by *W. Löffler* in 1932). All three occurred during the summer months June–July. This illness is generally known under the rather vague names of 'Sommergrippe' or 'Influenza' and is mostly not taken seriously. But sometimes painful symptoms make it necessary to consult the doctor.

"According to the author's 7 years investigations the first epidemic made possible the roentgenological observation of 8 infiltrates, among them a boy H., who fell ill 4 times in 5 years. Besides these roentgenological findings some suspicious symptoms were observed on other persons of the same family, such as increased blood eosinophilia, coughing and dyspnoea, on the whole 7 cases. The ascaris-aetiology of the illness was proved by the presence of ascaris eggs in the garden-soil.

"The second and third epidemics occurred during the years 1951 and 1958 in another family. The extraordinary intensity of the subjective symptoms and the massive objective findings were the surprising facts of the epidemic 1951. The epidemic 1958 took a better turn. We have to consider that quantitative moments at the time of the infection with ascaris larvae also determine the intensity of the disease."

SUGAWARA, K. [**Studies on the Differentiation of Vital and Dead *Ascaris* Ova by Staining. I. Preparation of the Smears of *Ascaris* Eggs by Removal of the Protein Membranes**] *Japanese J. Nation's Health.* 1959, Mar., v. 28, No. 1, 11–15. [**II. Fundamental Experiments of Staining Methods and the Differentiation of the Fate of *Ascaris* Eggs in Faeces by Staining**] *Ibid.*, 16–22, 16 coloured figs. on 2 pls. [In Japanese.]

The English summaries appended to the papers are as follows:—

i. "For the differentiation of the fate of ascaris eggs, this study is concerned with the method to remove protein membranes of ascaris eggs and the preparation of the smears of eggs of which protein membranes have been deprived.

"To remove protein membranes of ascaris eggs, 10 g. of chlorinated lime shall be mixed with 100 cc. of physiological salt solution. To this mixture 100 cc. of 15% sodium carbonate and 0·5 g. of pancreatin shall be added, stirred up, and filtered. Then ascaris eggs shall be put into the subsequent

solution, and these protein membranes can be completely dissolved in it in a short time. After smearing the eggs to the object glasses, and drying them up, the smears with single layer of the eggs can be made.

" In the above-described procedure ascaris eggs were not met with any injury and were not allowed to exfoliate from the specimens. By the use of this means, various parasitological methods were remarkably simplified compared with those which have hitherto been intricate in use. Because, in addition, it will be possible that its immediate application is maintained to various tests of ascaris eggs, this method is regarded to contribute to further development of parasitological examination."

ii. " Various staining methods applicable to the differentiation of the fate of ascaris eggs were investigated by use of cytochemical stainings on fats, polysaccharides, nucleic acids, vitamins, proteins, and enzymes in both vital and dead eggs.

" Experimental results demonstrated that Feldman's procedure for Sudan black B stain for lipoid, Lollain Smith's Nile blue sulfate method for neutral fats, Lillie's method for desoxyribose-nucleic acid, Brachet's pyronin-methyl green staining for desoxyribose and ribose nucleic acids, Deane's method for ascorbic acid, Chèvremont and Frédéricq's demonstration of sulfhydrils, Millon's method for total protein, respectively, were found to be proper. Most excellent among the above-mentioned methods for the differentiation of vital and dead ascaris ova were Smith's Nile blue sulfate method for neutral fats and the demonstration of sulfhydrils by Chèvremont and Frédéricq."

Flores, Espinosa, J., Ordóñez Acuña, A. & Del Razo, M. Veinticinco ascárides en un coledoco. [**25 Ascarids in the Bile Duct**] *Gac. Méd. de México.* 1958, Sept., v. 88, No. 9, 653–68, 15 figs. [21 refs.]

Report of a case.

Sipahioglu, H. **Filariasis in Turkey.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1959, Mar., v. 53, No. 2, 151–3. [10 refs.]

The first case of filariasis was observed in Turkey in a soldier from Alanya, in 1954. He presented symptoms of chyluria. Since this time more cases of filariasis and 15 of elephantiasis have been observed. The periodicity is nocturnal. A second case was discovered in 1955 by finding filariae in the skin biopsy of an elephantiasis patient.

The present author examined 312 natives of Alanya. In 32 microfilariae were found at night and in 4 they were detected during the daytime, in 2 of them by direct examination as well as by concentration (2% formalin). The incidence in this district is therefore about 10%.

Some of the filariasis subjects showed no symptoms, whereas others did. Only 4 presented clinical pictures attributable to filariasis. In 2 out of the 3 presenting with swelling of the testis and epididymis, thickening of the skin and early elephantiasis of the scrotum were observed.

30 patients underwent treatment with diethylcarbamazine in doses of 2 mgm. per kgm. of body weight. *Philip Manson-Bahr*

Li, Huei-Han. [Compiled by.] **Studies on Filariasis in New China.** *Chinese Med. J.* Peking. 1959, Feb., v. 78, No. 2, 148–60.

Filariasis exists in China between latitudes 37·5° and 18° N. *Wuchereria malayi* occurs with *W. bancrofti* in all affected provinces except Kwantung, Taiwan and Shantung where only the latter occurs. Between 20 and 30 million people are infected and some 40 million working days are lost because of acute symptoms. Details are given concerning the diagnosis, incidence and manifestations of the disease. *W. bancrofti* was not found in children aged under 2 years but a significant number aged 1 to 2 were infected with *W. malayi*. The peak incidence of infection was reached in the third decade after which it remained steady. The main vector of *W. bancrofti* is *Culex pipiens* var. *pallens* which is generally the most prevalent mosquito. *Anopheles hyrcanus sinensis* is the principal vector of *W. malayi*. The factors responsible for filarial endemicity include extensive breeding of the vector in pits in which faeces is stored for use as a fertilizer. Diagnosis was by blood film taken in the evening, since both species were nocturnally periodic. The dehaemoglobinized films were immediately examined microscopically by some workers and only those found positive were stained. Concentration methods and provocative injections of diethylcarbamazine were also used.

Microfilaria carriers were treated with diethylcarbamazine 200 mgm. thrice daily for 7 to 10 days. Lymphangitis, etc., sometimes followed treatment and was believed to be due to action of the drug on the worm which was often found dead or dying in the lymph nodes. A cure rate of 70% to 93% was given by this treatment on resurvey 3 to 17 months later. Early reactions to the drug were common but did not confine the patient to bed. Intensive treatment with large doses of this drug for 1 to 2 days was less effective. Carbarsone, 0·5 gm. twice daily for 10 days, reduced the parasite load but was toxic to the liver in 5% of persons treated; it is not suitable for mass treatment. Treatment of lymphatic obstruction was by surgery, the use of placental extract and traditional Chinese remedies.

Vector control varied with the season. Adult *C. pipiens* hibernating in cellars and wells were destroyed by fumigation with Gammexane. In early spring the breeding places of this species were treated with Gammexane which was repeated every 10 days until the onset of winter. Where possible, breeding places were eliminated by mobilizing the people in an environmental sanitation campaign. Adult mosquitoes were controlled by spraying DDT emulsion or Gammexane wettable powder during the period of their prevalence.

[This abstract only picks out the more salient features of this detailed report.]

T. H. Davey

Jordan, P. **A Note on the Effect of a Blood Meal on Infective Larvae of *Wuchereria bancrofti* in *Culex fatigans*.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1959, Mar., v. 53, No. 2, 148–50.

The infection rate for infective forms of *Wuchereria bancrofti* in laboratory-bred and infected *Culex fatigans* [*C. p. fatigans*] was, in three experiments, 45%, 51% and 74% if the entire mosquito was examined, but only, respectively, 18%, 26% and 30% if infective forms in the proboscis only were recorded. It is suggested that epidemiological data on the infectivity of mosquitoes should be based on the infective forms found throughout the

mosquito and not merely on those in the proboscis. Movement of infective forms within the body has been known from earlier work [this *Bulletin*, 1946, v. 43, 52]. This note confirms the fact and emphasizes its significance. Infective larvae were fewer in all parts of the body immediately after a blood meal, suggesting a forward movement of these larvae and the escape of many by the proboscis during engorgement. *D. S. Bertram*

LAING, A. B. G. **The Dusky Leaf Monkey (*Presbytis obscurus*) as a Natural Host of *Wuchereria malayi* in Malaya.** [Correspondence.] *Trans. Roy. Soc. Trop. Med. & Hyg.* 1959, Mar., v. 53, No. 2, 213–14.

This correspondent, from Malaya, refers to the finding by EDESON *et al.* [this *Bulletin*, 1956, v. 53, 349] of a *Wuchereria malayi* type infection in *Macaca irus*, in which the infection rate (3/55) was much lower than that in man. Negative results have since been obtained with 60 more monkeys of this species and 14 short-tailed macaques (*M. nemestrina*). The authors quoted had also reported *W. malayi* type microfilariae in a banded leaf monkey, *Presbytis melalophos*, but Laing suggests that this animal may have been identified wrongly, as the dusky leaf monkey (*P. obscurus*) has been the only species of this genus found since. In 17 out of 20 of these, sheathed microfilariae resembling those of *W. malayi* have been found (an infection rate higher than that in man), and adult worms indistinguishable from *W. malayi* were found in the lymphatic systems of 16.

Evidently there is a reservoir of *W. malayi* in a relatively common forest animal and the infection rate is high enough to be considered epidemiologically important. *H. J. O'D. Burke-Gaffney*

TURNER, L. H. **Studies on Filariasis in Malaya: the Clinical Features of Filariasis due to *Wuchereria malayi*.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1959. Mar., v. 53, No. 2, 154–69, 1 fig. [44 refs.]

The symptoms and clinical signs of *Wuchereria malayi* filariasis have not been adequately described. The author reviews the literature [see especially this *Bulletin*, 1939, v. 36, 149] and presents fresh data from Malaya in comparison.

Enlargement of lymph nodes

The patients, 57 in all, came from Penang and of these 29 (or 51%) had palpable nodes, 28 had superficial inguinal or femoral glands (1, cervical, 6, epitrochlear, 1, external iliac). From this it became apparent that less than half of all the microfilaria carriers had palpable nodes and this proportion became only slightly higher (51%) when blood-negative, but clinically positive, patients were included. The superficial inguinal and femoral groups were most commonly palpable, but the epitrochlears were seldom felt, and in no case were palpable axillary glands found.

Periodic (or episodic) adeno-lymphangitis

The first symptoms are usually painful and tender enlargement of the superficial inguinal nodes of one side, accompanied by fever and constitutional symptoms. There may even be a rigor. After some hours pain and tenderness,

and later band-like streaks of redness of the skin in the course of the lymphatics, are observed. This retrograde, centrifugal or descending lymphangitis is quite characteristic and there is sometimes, also, subcutaneous induration. The fever and constitutional symptoms usually persist for 3 to 5 days before ending by rapid lysis or by crisis with sweating. Swelling of the foot may be observed by the third day and tends to recur until eventually elephantiasis develops. Probably acute episodes never occur at more than one site at the same time. In 60 patients, 58 had fever, 59 adenitis, 48 lymphangitis and 58 swelling. Microfilariae were seldom found in association with elephantiasis, but were commonly present in patients with fever and adenitis. Adenitis was almost a constant feature of acute episodes, but lymphangitis did not occur in one-fifth of the patients. In acute adeno-lymphangitis, the arms were affected in only 2 of 26 patients. Regular monthly episodes were uncommon, but attacks were more frequent in patients with elephantiasis. Only 3 with abscesses were seen; all were microfilaria carriers. Permanent thickening of the lymphatics, a cord-like induration, may occur after frequent attacks. Elephantiasis of the arms is much less frequent than that of the legs, and elephantiasis of the uro-genital organs and breast very rare. Elephantiasis of the legs is the obvious feature of infection with *W. malayi*.

The course of *W. malayi* filariasis is unpredictable and variable: but there is a broad pattern of events and this is shown diagrammatically in a figure.

Sub-clinical filariasis

The blood-negative initial stage, the pre-patent period, has been determined in cats to be 76–80 days [*ibid.*, 1958, v. 55, 196] and these findings accord with the age ($3\frac{1}{2}$ months) of the youngest microfilaria carrier found among the population of the local endemic area.

Patent phase or microfilaraemia

A proportion of infected persons have, after some time, microfilariae circulating in the blood. It has been ascertained that a certain number of carriers in an endemic area may become negative once more without any form of treatment, and without developing clinical filariasis.

Clinical filariasis

A large number of microfilaria carriers are apparently unaffected by their parasites so that enlarged nodes to be found cannot in them be attributed definitely to filariasis. Recurrent adeno-lymphangitis is a late manifestation in endemic areas. In one community of 242 persons (microfilaria rate 26·8%) 12 gave a history of acute episodes, but had no elephantiasis; another 10 had elephantiasis as well. The youngest of these 22 patients were aged 20–24 years, although it was ascertained that microfilaria carriers were present in every age-group above 5 years. Acute episodes may cease spontaneously before elephantiasis develops.

Elephantiasis

It is usually dependent on acute episodes of adeno-lymphangitis, but may also develop in their absence. Personal peculiarities may be as important as hyperfilariation in contributing towards the later clinical manifestations such as acute episodes and elephantiasis. They may be partly immunological.

Diagnosis

Diagnosis still rests on the demonstration of microfilariae. Daytime blood films will not often contain any of the periodic form of *W. malayi*. Films for diagnosis in individual patients should be of about 60 cmm. of blood. Minor differences can be seen between the two forms (periodic and aperiodic) in thick films stained with Giemsa. In blood-negative symptomless suspects diagnosis cannot be made in the absence of a reliable test. Intradermal reactions to *Dirofilaria immitis* antigens are not specific and the results of complement-fixation tests seem to be of little value.

Tropical eosinophilia

Tropical eosinophilia and its clinical features are commonly seen in areas where *W. malayi* is endemic and the aetiology still remains a puzzle.

The author emphasizes the early signs and symptoms of *W. malayi* filariasis, because serious sequelae may be prevented if the patient is treated at an early stage. *Philip Manson-Bahr*

CHINESE MED. J. Peking. 1959, Mar., v. 78, No. 3, 226–7. **Single Dose Night Treatment of Filariasis with Hetrazan.**

In the Fukien province of China infection with *Wuchereria malayi* is endemic; it has therefore been necessary to evolve a method of treatment with diethylcarbamazine which is applicable to the whole population.

It seemed probable that treatment at night would be more efficacious in view of the nocturnal periodicity of the microfilarial tide in the peripheral blood, and the side-effects of the drug would be better tolerated. The following treatment schedules were tested:—

1 dose at night	1·0 gm. at bedtime
1 dose during the day	1·0 gm. at lunchtime
2 doses during day and night	1·0 gm. at bedtime, 0·5 gm. next morning
2 doses on successive nights	1·0 gm. at bedtime on 1st night 0·5 gm. at bedtime on 2nd night

Of these, the single dose of 1·0 gm. at bedtime proved to be the most satisfactory. Cure rates ranged from 90 to 96·6% over a 3-month period of observation. In intense infections, with microfilarial counts exceeding 100 per 20 cmm. of blood, complete elimination was usually not achieved, but a reduction in microfilarial counts of about 95–97% was observed. [This reduction, if permanent, would clearly suffice to break the cycle of endemicity.]

Proportionate doses for children were calculated as follows:—

aged 6 months to 1 year	one-eighth adult dose
„ 1–2 years	one-sixth adult dose
„ 3–5 years	one-fourth adult dose
„ 6–8 years	one-third adult dose
„ 9–12 years	one-half adult dose
„ 13–16 years	two-thirds adult dose

[Readers are referred to work in the Gambia (this *Bulletin*, 1953, v. 50, 232; 1956, v. 53, 638) which suggests that the drug acts on the adult reproductive organs and that immature worms may escape its action to develop full reproductive powers at a later date. Repetition of treatment at long intervals may be necessary in order to achieve complete elimination. See also studies from Tahiti (*ibid.*, 1954, v. 51, 503) which showed that diethylcarbamazine at a dosage of 6 mgm. per kgm. body weight, given at monthly intervals for 12–18 months, effectively controlled a formerly intense endemicity.

The abstracter feels that the results achieved by this single dose therapy should be re-assessed one year after treatment and that judgment should be deferred until this has been done.] *J. H. Walters*

SAUNDERS, Dorothy C. **Microfilariae and Other Blood Parasites in Mexican Wild Doves and Pigeons.** *J. Parasitology*. 1959, Feb., v. 45, No. 1, 69–75, 9 figs. on pl. [10 refs.]

RODGER, F. C. **The Movement of Microfilariae of *Onchocerca volvulus* in the Human Eye from Lid to Retina.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1959, Mar., v. 53, No. 2, 138–41, 10 figs. on 3 pls.

The author's conclusions were as follows:

"(1) A study of the possible routes of entry of mf. of *O. volvulus* into the different ocular tissues was carried out on 10 eyeballs.

"(2) Serial sections were made after low-viscosity nitro-cellulose embedding; paraffin was used in the case of the lids. The uveal melanin was bleached, before the sections were stained by the Masson method and a modified phloxine tartrazine technique.

"(3) It was concluded that the most common route taken by the mf. is from the bulbar conjunctiva into the cornea between the epithelium and Bowman's membrane. The sclera appears to offer a strong barrier to their passage, except at its anterior extremity where its fibres mingle with the corneal lamellae; thence the mf. can reach the uvea.

"(4) It was also discovered that the parasites traverse the adventitial sheaths of the perforating blood vessels at the limbus, and the equator, and (perhaps) of the nutrient vessels to the optic nerve.

"(5) It is believed that the presence of mf. of *O. volvulus* in the retina described in this paper is an original finding, and that the photomicrographs of mf. within the retina, vitreous and the optic nerve are the first ever to be reproduced."

[The abstracter is not entirely satisfied that the author has proved his points 4 and 5. The sections designed to demonstrate point 4 show the microfilariae in such a fragmentary state that it is difficult to be sure that they are microfilariae at all, and impossible to identify them as those of *O. volvulus*. The same criticism applies to Figure 8, which shows a fragment of a microfilaria in the human retina.

Figure 9 is a beautiful demonstration of a microfilaria entirely within the lumen of the vessel; nevertheless the author suggests that it lay in the sheath of a retinal blood vessel with its head projecting into the lumen, but it does not look like this from his illustration. Again, one cannot be certain that this is

a microfilaria of *O. volvulus*; it could, for example, be of *Dipetalonema perstans*.

Whatever the true interpretation of these two figures, it is worth noting that the surrounding retina looks perfectly healthy and it is evident that there is not much connexion between these sections and the full-blown fundus lesion which is alleged to be due to onchocerciasis. The classical pathology here is a primary sclerosis of the choroidal vessels and not the retinal vessels, with a consecutive atrophy of the overlying retina and proliferation of the pigment cells.

In fairness to the author, it must be stated that he makes no claim in this paper that his findings explain these alleged fundus changes in onchocerciasis.]

D. P. Choyce

Shah, B. N. & Modi, C. J. **Piperazine-Tetracycline Combination Therapy of Threadworm Infestation.** *Indian J. Med. Sci.* 1959, Feb., v. 13, No. 2, 99–104. [16 refs.]

The authors in this discursive article review previous reports on the treatment of enterobiasis by piperazine salts and by oxytetracycline; they point out that results prove very disappointing when followed up for more than 10 days. They therefore tested the effect of both drugs in combination. The daily dose administered was piperazine 75 mgm. per kgm. body weight and tetracycline phosphate (as Mysteclin-V, which contains additional nystatin as a fungicidal agent) 22 mgm. per kmg. The piperazine was given in 2 divided doses, the tetracycline in 3 or 4 divided doses. Treatment was continued for 7 days. The cellotape anal swab technique [this *Bulletin*, 1955, v. 52, 1009] was used for diagnostic purposes, no faecal egg-counts being performed.

The 29 subjects [shown in a table as 28] ranged from 5 to 30 years in age. Infection was judged to have been heavy in 7, moderate in 9 and light in 13. Though every subject showed negative swabs on completion of treatment, follow-up examinations 1, 2 and 7½ weeks after this showed the reappearance of ova in 5, 19 and 54% of patients respectively. It is suggested that reinfection may have accounted for some of the last, since treatment of whole families was not practicable.

The authors do not consider that the combined treatment showed any advantage over the use of piperazine alone.

[The abstracter notes this opinion with relief for he feels that the general adoption of an oral tetracycline antibiotic for so widespread and innocuous an infection would be dangerous as well as unjustifiably expensive.]

J. H. Walters

Zimmermann, W. J., Hubbard, E. D. & Biester, H. E. **Studies on Trichiniasis in Iowa Wildlife (1955–56 and 1956–57 Seasons).** *J. Parasitology.* 1959, Feb., v. 45, No. 1, 87–90, 1 fig.

"Studies were conducted during the hunting and trapping seasons of 1955–56 and 1956–57 to determine the prevalence of trichiniasis in the wildlife of Iowa. *T. spiralis* has been found in 7 species of wildlife, namely mink (4·5%), fox (8·5%), opossum (0·9%), raccoon (0·6%), striped skunk (2·5%), spotted

skunk (2·2%), and coyote (4·8%). This is apparently the first report of trichiniasis in the spotted skunk. Two or more infected species have been found from 9 of the 10 sampling areas."

DEFICIENCY DISEASES

STANDARD, K. L. **A Pilot Nutrition Survey in Five Low-Income Areas in Jamaica.** *West Indian Med. J.* 1958, Sept., v. 7, No. 3, 215–21.

WADSWORTH, G. R. **Weight Changes on Cooking Maize and Beans and Quantities eaten by Healthy Males.** *J. Trop. Med. & Hyg.* 1959, Apr., v. 62, No. 4, 95–6.

The water uptake of various maize meals on cooking was determined. The weight of cooked meal may vary from just under 3 to over 11 times that of the dry meal. The weight increase was greater with fine meals. The weight of beans increased from 2 to 2·5 times on cooking. These results indicate the difficulty of estimating the intake of nutrients from weighings of wet meals.

R. Passmore

GILLMAN, T., HATHORN, M. & CANHAM, P. A. S. **Experimental Dietary Siderosis.** *Amer. J. Path.* 1959, Mar.–Apr., v. 35, No. 2, 349–67, 1 text fig. & 17 figs. on 3 pls. [32 refs.]

Rats absorbed excess iron in much greater quantity from an ill-balanced (maize-meal) diet than from a good stock diet. The concentration of iron in the liver could be raised to 367 mgm./100 gm. wet weight—more than 10 times the normal figure. At first the iron could be demonstrated histologically only in the hepatic cells at the periphery of the lobule, but later it was evident in the Kupffer cells and other liver phagocytes. The appearance of the livers closely resembled human siderosis as seen in Africa [this *Bulletin*, 1952, v. 49, 1166]. It is concluded that dietary siderosis in man may be attributable to a poor diet, which in some way affects intracellular metabolism, and that it is probably not due solely to an excess intake of iron. *R. Passmore*

LEEVY, C. M. **Nutritional Factors in Liver Disease in Man. A Review.** *Amer. J. Clin. Nutrition.* 1959, Mar.–Apr., v. 7, No. 2, 146–60, 4 figs. [139 refs.]

"(1) Malnutrition, often observed in patients with liver disease, may contribute to its development, occur secondary to morphologic changes in the liver, or be unrelated to the hepatic disorder. Nutritional factors appear to be important in development of the fatty liver-cirrhosis syndrome, however. This condition is always seen in the presence of alcoholism, parasitism, or some

other pathologic process which alters normal body processes. It is not possible to clearly delineate the individual role of poor dietary habits and other factors in development of hepatic changes.

"(2) Utilizing serial liver biopsies in man, it is possible to demonstrate a transition of fatty liver to cirrhosis and eventual development of hepatoma in malnourished alcoholic subjects. The frequent occurrence of this sequence makes it desirable to consider fatty liver as the first stage of cirrhosis, as early recognition and treatment with an adequate diet prevents development of cirrhosis and its complications.

"(3) Evidence of malnutrition is frequently found as a secondary phenomenon in the patient with hepatic disease due to decreased intake, abnormality of absorption and/or decreased assimilation and utilization of foodstuffs. Resulting alterations in intermediary metabolism may delay or prevent recovery from hepatic disease."

OOMEN, H. A. P. C. **Nutrition and some Disorders of the Eye in the Tropics.** *Trop. & Geograph. Med.* Amsterdam. 1959, Mar., v. 11, No. 1, 66–9. [16 refs.]

"The two most important nutritional disorders of the eye in the tropics probably are xerophthalmia and retrobulbar neuropathy. As a public health problem under normal conditions they have vanished from countries in temperate climates. Their nature and significance are discussed. A plea is made for a more accurate and efficient approach." [See this *Bulletin*, 1955, v. 52, 78; 1958, v. 55, 451.]

MONEY, G. L. **Clinical Aspects of Tropical Ataxic Neuropathies related to Malnutrition.** *West African Med. J.* 1959, Feb., v. 8 (n.s.), No. 1, 3–17. [35 refs.]

"The syndrome described here is a disease of the nervous system occurring in sporadic or endemic form, affecting women in the child-bearing period more often than males and related specifically to poor social circumstances. It is characterised by an acute or subacute onset of unsteadiness of gait preceded by or associated with certain subjective sensory disturbances; it varies in severity from clinically occult ataxia to frank ataxic paraplegia. Motor power is surprisingly well preserved."

The author has carried out a detailed clinical investigation on a group of 100 Nigerian patients, 22 of whom were studied in the wards of University College Hospital, Ibadan, while 78 were seen in their homes in villages of the Epe district of southern Nigeria, some 30 miles north-east of Lagos. All of them showed the syndrome defined above in severe form, but a field survey suggested that minor examples of the disease, lacking a gross defect of locomotion but having demonstrable sensory ataxia, exceeded by 2 or 3 times those selected for study on account of their severe ataxic disability.

The age distribution ranged from 11 to 70 years: females outnumbered males by 60 to 40. The highest incidence of the disease occurred in women in the fourth decade, in men in the fifth. A familial distribution was only found when the related sufferers were all living in the same household—"a common cooking pot seemed more important than heredity". In many

patients some stress appeared to have precipitated the onset; such were pregnancy and lactation, chronic diarrhoea and pyrexia of any cause. In one remarkable instance the syndrome developed acutely in a man of 22 who was recovering from an attack—otherwise uneventful—of typhoid fever treated with chloramphenicol. Muco-cutaneous lesions suggestive of riboflavin deficiency had been present in 96% of patients intermittently for many years, in 74 instances for more than 15 years. Among 23 patients where skin lesions had recently been particularly acute, 5 developed an exacerbation of their neurological disease. These epithelial lesions comprised angular stomatitis, glossitis and scrotal dermatitis.

The onset of the neurological syndrome was heralded by a variable subjective disturbance of sensation, usually in the form of pain and paraesthesia in the lower limbs. The well known " burning feet syndrome " was reported by 36% of patients. Objective changes in superficial sensation, as patchy hypoaesthesia to light touch and pin-prick below the knee, were noted in 51 out of 69 subjects.

Impairment of joint position sense and of the appreciation of vibration was the characteristic finding in this series. In 82% this was readily demonstrable but in the remaining 18% the ataxia appeared to be due to a sensory loss too subtle for clinical recognition. In no patient was it possible to demonstrate signs of cerebellar dysfunction, such as nystagmus. Although in most patients the sensory ataxia was limited to the lower limbs, those with a severe ataxic paraplegia also showed clumsiness of the fingers and hands. Anomalous tendon reflexes were rarely found in the arms, but the ankle jerks were absent in 82% and both knee and ankle jerks were lost in 36% of patients. Clear signs of a lesion of the pyramidal tracts were evident in 3% of the subjects.

Sphincter function remained unimpaired except in 1 of the 3 patients showing pyramidal tract damage in whom incontinence developed but cleared as the cord lesion, which was of recent origin, improved under massive vitamin therapy. Loss of libido and impotence were common in male sufferers, one of whom complained that his three wives had deserted him on this account! Sluggishness of the peripheral circulation with mild trophic changes was evident in the lower limbs of those most severely affected.

Associated neurological symptoms comprised defective vision in 87%, defective hearing in 25% and recurrent laryngeal nerve palsy in a single patient. Ophthalmoscopy which was carried out on 92 subjects showed normal appearances in 57·6%, bilateral pallor of the temporal half of the disc in 29·3%, " acute optic neuropathy " in 5·5% and primary optic atrophy [evidently total pallor of the optic disc] in 8·6%. Perimetry was performed in 10 patients while in hospital: 5 showed normal fields of vision, large paracentral scotomata were demonstrated in 2 and concentric constriction of the visual fields in 3 [the significance of the last finding is doubtful]. In all but one patient among those who were deaf the lesion lay in the auditory nerve; the only exception showed a conduction deafness due to otitis media.

Neuropsychiatric features were shown by a minority of patients, these being anxiety and depression, liability of emotion and gross dementia, the last in a single elderly male.

Laboratory investigations were carried out on the 22 hospital patients. These served to exclude all other established causes of spinal neuropathy, including syphilis, disseminated sclerosis, pernicious anaemia, malignancy and vertebral disease. A haemoglobin concentration of less than 80% was found in only 4

patients, in none of whom did the marrow appear megaloblastic. The cerebrospinal fluid showed a pleocytosis in 3 and a raised protein concentration in 4 out of 21 patients. The Kahn reaction was negative in the blood of 20 out of 21 subjects. Radiological examination of the chest and spine showed no abnormality in any of the 20 patients on whom it was carried out.

Treatment comprised the parenteral administration of the B group of vitamins, especially aneurine and B12, and of liver extract, while yeast concentration was given orally at a later stage. Response to treatment, however, varied inversely with the degree of posterior column dysfunction which had already developed and with its duration before the initiation of therapy, for it was clear that when the cord damage was marked, or, if of minor degree, had been present for more than 3 months, little real recovery could be expected. Training designed to teach patients to compensate for their disability and to instil hope and confidence achieved a degree of improvement even in those most severely affected and justified the use of determined physiotherapy.

The author observes that the early lesion involves the first sensory neurone which has its cell in the posterior root ganglion and its axes lying in the peripheral nerve and in the posterior columns of the spinal cord. Analogous bipolar sensory nerves, the optic and the auditory are often affected at the same time. In the extreme case the pyramidal system, the cerebrum and the autonomic system may all show degenerative changes. Though the syndrome must clearly be attributed to a deficiency of vitamins of the B group, further research is required into the biochemical lesion or lesions which lead to this highly selective nerve damage.

[This is a most valuable and important paper, for although the syndrome described is world wide, it would appear to be particularly common in Nigeria. One wonders whether the eaters of cassava are unusually prone to it, and if so whether the significant cyanide content of this substance, demanding sulphydryl groups for its detoxication, provides a contributory aetiological factor.] *J. H. Walters*

YADA, Y.; FUKUDA, H. [**Studies on the Effects of Thiamine-Enriched Rice. Part 1. The Administration of Enriched Rice to the Patients with Symptoms of Beriberi**] [YADA]. *Japanese J. Nation's Health*. 1959, Mar., v. 28, No. 1, 173–6, 2 charts. [12 refs.] [**Part 2. The Introduction of Rice Enforcement into the Busiest Farming Seasons**] [YADA & FUKUDA]. *Ibid.*, 177–9, 1 chart. [In Japanese.]

The English summaries appended to the papers are as follows:—

i. "In the present investigation the patients with symptoms of beriberi in the dormitory of a certain chemical factory were subjected to daily administration of 2 g. of thiamine-enriched rice continuously for 3 months. Experimental results indicated that the minimum blood pressure rose, and the thiamine concentration in the blood as well. With respect to the subjective and objective symptoms of beriberi there was a prompt return to the original level."

ii. "The effects of thiamine-enriched rice were observed among the people in a village, chosen as the experimental area during the busiest farming period from the rainy season throughout summer, in Kyoto prefecture. In this area, 2 g. of thiamine-enriched rice was administered daily to each person. As a

result, it was found that although the thiamine amount in the blood would show a continuous decrease during the busiest farming season, the administration of thiamine-enriched rice did not fail to maintain the content of thiamine at the standard value and to contribute to the inhibition of the output of B_1 deficiency."

Back, E. H. & Cole, W. R. **Osteopetrosis associated with Ricketts and Scurvy.** *Brit. J. Radiol.* 1958, Dec., v. 31, No. 372, 709–11, 2 figs.

Report of a case.

Vis, H., Dubois, R., Loeb, H., Vincent, M. & Bigwood, E. J. Le profil des chromatogrammes d'aminoacidurie en pathologie de l'enfance. (Application à des cas de kwashiorkor africain.) [**The Chromatographic Profile of Aminoaciduria in Diseases of Childhood (Application to Two Cases of Kwashiorkor in Africa).**] *Ann. Soc. Belge de Méd. Trop.* 1958, Oct. 31, v. 38, No. 5, 991–1008, 11 figs. [18 refs.]

The authors have examined the urine of children with kwashiorkor by two-dimensional chromatography, and have determined the nature of the amount of the amino-acid excreted. There was a general increase in aminoaciduria which rose further when the children were put on a high protein diet (6 to 8 gm. per kgm. body weight). In the children with kwashiorkor there was a most striking rise in glycine and histidine when this high protein diet was applied. Some increase was also noted in the amount of alanine and serine.

In general, children with kwashiorkor had a much higher urinary excretion of taurine and β-aminoisobutyric acid than normal children. The taurine excretion can be explained by either renal or liver damage, but that of β-aminoisobutyric acid can only be caused by an extra renal factor.

H. Lehmann

Jones, P. R. M. & Dean, R. F. A. **The effects of Kwashiorkor on the Development of the Bones of the Knee.** *J. Pediatrics.* St. Louis. 1959, Feb., v. 54, No. 2, 176–84, 4 figs.

Radiographs of the knees of African children with kwashiorkor showed poor calcification compared with those of the knees of healthy children of the same age.

Transverse lines, indicating past disturbances of growth, were much commoner in the femur and tibia of the children with kwashiorkor.

R. Passmore

Harney, Lenore. **The Effect of Additional Dietary Skimmed Milk on the Nutrition of Children of the Colony of St. Kitts Nevis Anguilla using Deaths from Malnutrition in the Age-Group 1–4 Years as Indicator.** *West Indian Med. J.* 1958, Sept., v. 7, No. 3, 211–14.

Since 1954 skimmed milk has been sent to the colony by UNICEF. This milk is distributed to pregnant and lactating women and to clinic children

after weaning. The death rate from malnutrition among children aged 1–4 averaged 3·4 per 1,000 for the 4 years before the introduction of the milk and this figure fell to 1·3 for the 3 subsequent years. It is considered that the additional milk is the only likely cause of the reduced mortality.

R. Passmore

SPRUE

Sölvell, L., Hallberg, L. & Brise, H. Järnresistent järnbristanemi. Järnresorptionen vid idiopatisk sprue. [**Refractory Iron-Deficiency Anaemia. Iron Absorption in Idiopathic Sprue**] *Nordisk Med.* 1959, Apr. 2, v. 61, No. 14, 538–41, 4 figs. [13 refs.]

The English summary appended to the paper is as follows:—

"The absorption of iron in a case of idiopathic sprue with iron deficiency has been studied with a double tracer technique using ^{55}Fe and ^{59}Fe. A constant infusion of labelled iron in the stomach was used. To calculate the absolute absorption rate the plasma iron turnover was determined continuously and simultaneously. The absorption of iron was greatly diminished. By giving inert iron intravenously to study the release of iron from the mucosal cells the mucosal storage of iron was shown to be very small compared to normal.

"The low absorption and the decreased mucosal storage of iron is probably caused by the greatly diminished absorptive area through the atrophy of villi.

"Mechanisms other than the villous atrophy must be involved in the defective absorption in idiopathic sprue, since an increased (but not normal) absorption of iron is rapidly observed after giving steroids. Such probable factors are: interstitial oedema, diminished plasma flow in the mucosa or an increased mucus layer on the mucosal walls.

"With gastrointestinal and intravenous constant infusion techniques further information on the pathophysiology in mal-absorption syndromes can be obtained."

HAEMATOLOGY

Vaishwanar, P. S. **Blood Ascorbic Acid Levels of Indians in Different Age-Groups.** *Indian J. Med. Res.* 1959, Mar., v. 47, No. 2, 158–61, 1 graph.

"1. Three hundred healthy volunteers in the age-group of 4 to 45 have been chosen for the assessment of whole blood ascorbic-acid level.

"2. The mean ascorbic-acid value for the entire group is 0·87 mg./100 c.c. ± 0·01. The value decreases with the advance of age. The decrease of the normal value with the advancing years is statistically significant.

"3. The mean blood ascorbic-acid level is the same in both sexes."

GUPTA, S., SHARAD KUMAR, DEVI, K. P. & MANGALIK, V. S. **Studies in Anaemia of Infection. Part I. Plasma Iron, Iron-Binding Capacity of the Plasma and Free Erythrocyte Protoporphyrin in Normal Indian Subjects.** *Indian J. Med. Res.* 1959, Mar., v. 47, No. 2, 150–57, 4 graphs. [34 refs.]

"1. Plasma iron, iron-binding capacity of plasma and erythrocyte protoporphyrin were determined in normal subjects.

"2. Mean plasma iron for 100 subjects was found to be 117 μg. per cent ± 25. Plasma iron in males was significantly higher than females.

"3. Total iron-binding capacity in 50 individuals ranged from 167 to 350 μg. per cent with the mean value of 250 μg. ± 42.

"4. Mean erythrocyte protoporphyrin in 42 persons was 39 μg. ± 15. No significant difference was observed in the two sexes."

VACHHRAJANI, R. B. & SHENOY, M. A. **Haematological Status of Industrial Workers. (A Report on 1,000 Workers.)** *J. of J. J. Group Hosps. & Grant Med. College.* Bombay. 1959, Jan., v. 4, No. 1, 16–25, 3 figs.

The introduction of an Employee State Insurance Scheme in Bombay afforded an opportunity of investigating the haematological status of 1,000 male industrial workers who appeared healthy and had no obvious defect in health on routine laboratory examination and X-ray of chest. Their ages ranged from 18 to 70, the largest number being in the third decade. The results are detailed in tables which cannot be abstracted briefly. The average red cell count was 4,621,000 per cmm. and 18% of the findings fell below 4 millions per cmm. Haemoglobin values lay between 12·5 and 14·5 gm.% in 38%, and in 39% were below 12·5 gm.%. Other mean values for red cells are tabulated. The mean total white cell count was 8,423 per cmm. and the average differential count was: polymorphs, 63·1% ; lymphocytes, 29·0% ; monocytes, 3·0% ; eosinophils, 4·3% ; basophils, 0·8%. Strict vegetarianism was observed by 44%, 39% were occasional and 17% regular meat-eaters. Protein intake was estimated to be between 30 and 40 gm. daily (between 20 and 25% of it being first-class) among the vegetarians and 35 to 45 gm. (about 50% first-class) daily in the non-vegetarians. The calorie intake was between 2,500 and 3,500 calories daily and the diet was deficient in green vegetables and iron. The blood findings varied with the diets, the red cell count being 5,000,000 per cmm. in 39·2% of non-vegetarians and in only 9·9% of vegetarians. The haemoglobin content also was higher in non-vegetarians.

There have been few observations reported on such a large number of healthy workers. When these results were compared with others from India the mean red cell count in this series was low and the haemoglobin was within the range of the others, but compared with other countries in both temperate and tropical areas the minimal findings for haemoglobin and red cells in this series are considerably lower and the maxima, though not the lowest, are low. On questioning, 7% of the workers admitted to fatigue and these were found to be among the 17·8% who had red cell values below 4 millions. *T. H. Davey*

TASKER, P. W. G. **Blood-Volume in Chronic Nutritional Anaemia.** *Lancet.* 1959, Apr. 18, 807–9, 3 figs. [11 refs.]

The author has studied the changes in plasma and blood volume in severe chronic anaemia in Malaya. There appears to be fairly general agreement that

the blood volume tends to fall in chronic anaemia, but particularly when the anaemia is very severe with a haemoglobin concentration of less than 4 gm. per 100 ml. However, there is less agreement on the changes that take place in the plasma volume, *i.e.*, it is not known whether the plasma volume expands partially to make up for the fall in blood volume due to the reduction in red cells, or whether the plasma volume remains essentially constant.

74 patients who were either haematologically normal or who had a chronic anaemia were studied, some of them with a haemoglobin level of less than 2 gm. per 100 ml. The anaemia was either of the nutritional megaloblastic type or due to an iron deficiency—the latter often associated with hookworm infection. When the plasma volume was related to the total circulating haemoglobin, no correlation was found, and the drop in blood volume went parallel with the diminution in the red cell volume. There was a distinct difference between the malnourished patients where the plasma volume was comparatively decreased, and pregnant women where there was a relative increase. In general, however, the more severe the anaemia became the lower was the blood volume with the plasma volume remaining constant. The drop in blood volume was thus largely accounted for by a reduction in red cell volume. When the anaemia became more severe, the readings of haemoglobin level were progressively too high when compared with the total circulating haemoglobin. In anaemias below about 3 gm.% haemoglobin per 100 ml. blood, the error was as much as 50% too high. As the power of the blood to transport oxygen depends both on the total amount of haemoglobin and on its level in the blood, the diminution of the blood volume should maintain the haemoglobin level as high as possible to support a carriage of oxygen as efficient as the anaemia will permit.

H. Lehmann

Undavia, J. V. & Daswani, H. D. **Clinical Trial of an Oral Iron Preparation in Hypochromic Anaemia in Women.** *J. of J. J. Group Hosps. & Grant Med. College.* Bombay. 1958, Oct., v. 3, No. 4, 281–6, 1 graph. [11 refs.]

To 54 patients with iron deficiency anaemia, whose progress could be followed at weekly intervals for 4 weeks, one gm. of ferrous gluconate was administered daily for 7 days, along with ascorbic acid, calcium, members of the vitamin B complex other than vitamin B12, and traces of cobalt, manganese, molybdenum, copper and zinc contained in a single preparation [Ferro-B-Cal]. The mean rise in haemoglobin of 28 pregnant women was 3·54 gm.% during the 4-week follow-up period. In 20 non-pregnant women the comparable rise was 4·78 gm.%. There were 6 patients whose response was negligible.

After comparing these results with those of other workers who had administered iron parenterally to comparable patients, the authors conclude that orally administered iron is as therapeutically effective over this period of time as is iron administered parenterally. [This is a conclusion with which the majority of physicians would agree and it serves as a useful reminder to the large minority who use " injection therapy " whenever it is possible to do so.]

A. W. Woodruff

Dreyfus, J. C. Les hémoglobines anormales. **[The Abnormal Haemoglobins]** *Rev. Française Études Clin. et Biol.* Paris. 1957, Apr., v. 2, No. 4, 382–412, 2 figs. [236 refs.]

DELANNAY, M. L'électrophorèse, sur papier, des hémoglobines. Méthode de routine de notre Laboratoire. [**Paper Electrophoresis of Haemoglobins. Routine Method in our Laboratory**] *Ann. Soc. Belge de Méd. Trop.* 1958, Dec. 31, v. 38, No. 6, 1091–99, 3 figs.

In this article from Jadotville, Belgian Congo, the author describes in detail the paper electrophoresis of haemoglobins used for the diagnosis of sickle-cell anaemia in his laboratory. The transverse technique with Whatman Paper No. 3 " for chromatography " is used. The paper is divided by slits running in the direction of the current. These slits do not extend to the ends of the paper which are immersed in the buffer. Each haemoglobin sample is applied between two slits. The stock barbiturate buffer, containing 20·6 gm. veronal and 3·68 gm. sodium barbitone per litre, is diluted six times, and an electric current of 300 volts applied. Thus a very rapid electrophoresis takes place, and results can be obtained within 5 to 6 hours. About 7 or 8 samples are simultaneously examined side by side.

[This technique will undoubtedly rapidly determine whether a sickler is a sickle-cell-trait carrier or the phenotype of the homozygous condition—sickle-cell anaemia. It would not enable a final differentiation to be made between haemoglobins with similar, although not identical, mobility.]

H. Lehmann

DUBE, B., SHARAD KUMAR & MANGALIK, V. S. **Absence of Abnormal Haemoglobins in 235 Subjects in Uttar Pradesh.** *Indian J. Med. Res.* 1959, Mar., v. 47, No. 2, 148–9. [11 refs.]

" In none of these 235 cases examined was any abnormal electrophoretic pattern seen. All haemoglobins moved on the filter-paper as a single band along with the normal adult controls (AA).

" The result of the estimation of foetal haemoglobin showed that the values ranged from 0 (in two persons) to 3·32 per cent. The mean value in 200 subjects was found to be 1·26 per cent."

RANNEY, Helen M. & KONO, P. **Studies of the Incorporation of Fe^{59} into Normal and Abnormal Hemoglobins.** *J. Clin. Investigation.* 1959, Mar., v. 38, No. 3, 508–15, 1 fig. [12 refs.]

" 1. The incorporation of Fe^{59} into the major components of hemoglobin in individuals with sickle cell trait, hemoglobin C trait, electrophoretically rapid major hemoglobin component of the " J group," probable hereditary persistence of fetal hemoglobin production and thalassemia major revealed no difference in Fe^{59} incorporation in the major components.

" 2. Observations on the minor electrophoretically rapid components of hemoglobin in a patient with sickle cell trait confirmed the observations of Kunkel and Bearn that the isotopic activity of this hemoglobin A_3 component gradually increased during the 50 day period of study.

" 3. The studies of the incorporation of Fe^{59} into the electrophoretically rapid component of the hemoglobin of rabbits also supported the hypothesis that the formation of an electrophoretically rapid hemoglobin component in experimental animals is correlated with erythrocyte aging. The possibility that

factors other than cell aging may influence the formation of this electrophoretically rapid normal component was discussed."

LAMBOTTE-LEGRAND, J. & LAMBOTTE-LEGRAND, C. Notes complémentaires sur la drépanocytose. IV.—L'association elliptocytose-drépanocytose. [**Notes on Sicklaemia: IV. Association of Elliptocytosis and the Sickle-Cell Trait**] *Ann. Soc. Belge de Méd. Trop.* 1958, Dec. 31, v. 38, No. 6, 1045–8, 1 fig. [19 refs.]

The English summary appended to the paper is as follows:—

"The authors describe a case of association of elliptocytosis and sickle cell trait; the electrophorese showed a greater amount of hemoglobin S than hemoglobin A." [For previous parts see this *Bulletin*, 1959, v. 56, 477.]

CHOREMIS, C., KIOSSOGLOU, K., MAOUNIS, F. & BASTI, B. **Amino-Acid Tolerance Curves and Amino-Aciduria in Cooley's and Sickle-Cell Anaemias.** *J. Clin. Path.* 1959, May, v. 12, No. 3, 245–53, 6 figs. [21 refs.]

"The increased elimination of amino-acids coupled with the abrupt fall of the plasma amino-N curve indicates that in Cooley's and sickle-cell anaemias the main error in handling amino-acids lies in their decreased kidney reabsorption. An enzymic dysfunction might be responsible."

LIE-INJO LUAN ENG. **Haemoglobin of New-Born Infants in Indonesia.** [Correspondence.] *Nature.* 1959, Apr. 18, v. 183, 1125–6, 2 figs.

Haemolysates of the cord blood of 633 Chinese and 480 Indonesian babies were submitted to electrophoresis on paper. Examples of two abnormal haemoglobins were detected. (i) In 1 Chinese and 2 Indonesian babies there was a small quantity of a component migrating slightly faster (at alkaline *p*H) than Hb E. In 2 of these cases the parents were examined, and one of each pair possessed Hb E. Since the mobility of Hb E is slightly increased when it occurs in low concentration, these cases are thought to represent an unusually early appearance of Hb E, which does not normally appear until some time after birth. (ii) In 21 Chinese and 2 Indonesian babies there was a small component of about the mobility of Hb J at *p*H 8·6. The parents showed no abnormal haemoglobins. This component was confirmed by Dr. FESSAS to be the same as that described by himself and Dr. PAPASPYROU [this *Bulletin*, 1958, v. 55, 444] in a new-born child. The author expects that it will be found to be fairly common in Far Eastern populations.

[For earlier studies by the author, see *ibid.*, 1956, v. 53, 235, 1376.]

Alan B. Raper

VAN DIJK, M. C. **Two Cases of Thalassaemia with Haemoglobin-E.** *Trop. & Geograph. Med.* Amsterdam. 1959, Mar., v. 11, No. 1, 96–9, 4 figs.

See this *Bulletin*, 1956, v. 53, 1376; 1958, v. 55, 1372.

Kaars Sijpesteijn, J. A. Thalassaemia minor in een Nederlandse familie. [**Thalassaemia Minor in a Dutch Family**] *Nederl. Tijdschr. v. Geneesk.* 1959, Apr. 18, v. 103, No. 16, 838–43, 3 figs. [47 refs.]

The English summary appended to the paper is as follows:—

"A Dutch family is described of which six members suffer from slight anaemia with microcytic polycythaemia, low mean corpuscular haemoglobin, and diminished osmotic fragility. There is a striking hypochromia, anisocytosis, poikilocytosis and punctate basophilia of the red blood cells; a number of target cells are present. Serum iron values are normal or high. Abnormal haemoglobin has not been demonstrated, but in one member of the family the $Hb.A_2$ level is raised. Thalassaemia minor was diagnosed.

"Some aspects of this hereditary anaemia are discussed. The condition occurs frequently in the Mediterranean area, but also throughout Southern Asia, including Indonesia, and may therefore be found in all those whose ancestors hail from there. Some causes are mentioned for the occurrence of thalassaemia in Dutch families without any known blood ties with the population of those countries."

Jandl, J. H. & Greenberg, M. S. **Bone-Marrow Failure due to Relative Nutritional Deficiency in Cooley's Hemolytic Anemia. Painful "Erythropoietic Crises" in response to Folic Acid.** *New England J. of Med.* 1959, Mar. 5, v. 260, No. 10, 461–8, 8 figs. [40 refs.]

Intercurrent haemolytic crises can occur for various reasons. Such aplastic crises usually last from 10 to 14 days, and they are supposed to be due to intercurrent infections and similar environmental factors. However, it has also been known that sometimes these aplastic crises could be due to deficiencies of erythropoietic substances. These would be used to a greater extent in haemolytic anaemia where red cell production is increased in an effort to compensate for the peripheral loss. Particularly in pregnancy it had been noted that folic acid deficiency could arise in patients with haemolytic anaemia. The present report concerns one patient with thalassaemia who, on three different occasions, suffered from aplastic crises which responded to massive treatment with folic acid. It was of interest that physiological doses of folic acid had no effect. Also, there were no morphological or biochemical features which suggested that there was folic acid deficiency. The only evidence of a relative folic acid deficiency was the rapid response to treatment by massive doses. For example, in one such episode, during an initial 6-day control period, the patient had an average urinary excretion of 5μgm. of folic acid per day. With daily injections of 400 μgm. of folic acid the urinary output rose without delay to a 4-day average of 8 μgm. per day, yet there was no response by the bone-marrow. When, however, 15,800 μgm. were given by mouth daily, an immediate response occurred, and the urinary folic acid levels promptly rose to an average of 5,540 μgm. daily. The possibility that the synthetic folic acid preparation contains a hitherto unknown contaminant possessing erythropoietic activity is rejected by the authors, and they suggest that they are dealing with a relative folic acid deficiency state. The term "relative-deficiency" is intended to indicate that, in certain situations, supranormal amounts of a metabolite may be necessary for maximal cellular growth.

Another interesting feature in this patient was that, in each of the three episodes of bone-marrow failure, the erythropoietic response to large doses of folic acid was initiated by bone pain. In each, pain appeared between 12 and 15 hours after the beginning of therapy, lasted for 1½–2 days, and was most intense in the lower spine and pelvis. The authors attribute this pain to the expanding pressure of rapidly proliferating red cell tissue within a marrow cavity already fully occupied by hypertrophied erythroid tissue.

[It is obvious that this is a most important report, and that its application to other types of chronic haemolytic anaemia will have to be considered whenever there is a relapse. It seems that it may be justified, at times, to try out large doses of folic acid on patients with haemolytic anaemia in relapse, even if there is no morphological or biochemical evidence of megaloblastic erythropoiesis.] *H. Lehmann*

VENOMS AND ANTIVENENES

KEEGAN, H. L. **Some Venomous Animals of the Far East.** 33 pp., 60 figs. on 26 pls. [Numerous refs.] 1958, June 1. San Francisco: Commanding Officer, 406th Medical General Laboratory, APO 343, U.S. Army Medical Center, Calif., U.S.A.

Although bites and stings by venomous animals account for only a very small number of hospital admissions for U.S. armed forces personnel, severe and sometimes fatal effects may result. The desirability of identifying the venomous species, where possible, is therefore obvious if specific treatment is to be carried out.

The following groups of animals with venomous representatives are briefly described and information given on the clinical features and treatment of people bitten or stung: jellyfish, corals and sea-anemones, urticating caterpillars and moths, spiders, scorpions, centipedes and millipedes, cone shells (genus *Conus*) and snakes. In the section on snakes the effect of bites by representatives of the following genera is discussed: *Agkistrodon* and *Trimeresurus* (pit vipers), *Vipera*, *Bungarus* (kraits), *Naja* (cobras) and *Laticauda* (sea snakes). Recommended regimes for snake bites are discussed and the following generally accepted points seem to be agreed upon. Antivenenes, if available, are the mainstay of treatment; immobilization of the bitten limb and the use of a tourniquet proximally to the bitten area are favoured by some authorities [but see also this *Bulletin*, 1954, v. 51, 724; 1958, v. 55, 89]. The value of antihistamines, cortisone and corticotrophin, has been investigated experimentally, with different results, while hyaluronidase appeared to be of value in treatment of cobra venom injections in experimental animals.

There are no systematic sections dealing specifically with identification of the various animals discussed but descriptions are given in the text of representatives and photographs and diagrams illustrate most of the points mentioned. An index would have helped. *E. R. Nye*

PARRISH, H. M. & POLLARD, C. B. **Effects of Repeated Poisonous Snakebites in Man.** *Amer. J. Med. Sci.* 1959, Mar., v. 237, No. 3, 277–86. [25 refs.]

14 patients, all of whom were experienced snake handlers and had on several occasions—one as many as 12 times—received bites from poisonous snakes, were examined for evidence of immunity against the venom of the pit vipers: rattlesnakes, moccasins, copperheads and cottonmouths. These pit vipers were responsible for most of the snakebites and, although several of the patients had developed allergy to the venoms, there was no evidence of any true immunity. The explanations offered for the absence of immunity are related to the fact that all the patients were well trained in first-aid treatment for snake bites and the majority received relatively large doses of polyvalent antivenene soon after being bitten, and also that the bites were spread so unevenly over periods of time that even if any antibody developed from a particular bite it was unlikely that subsequent bites would produce a booster effect.

It is of interest to note that several patients developed marked allergy to horse serum from the horse antivenene and that these allergies were a greater threat to patients who had been snake-bitten than the snake intoxication.

H. J. Bensted

SAUNDERS, P. R. **Venom of the Stonefish** *Synanceja verrucosa*. *Science*. 1959, Jan. 30, v. 129, 272–4, 1 fig.

"Moderate doses in rabbits produced hypotension, increased respiratory rate, and myocardial injury. Respiratory arrest occurred with fatal doses when the blood pressure had declined to very low values. The active substance (or substances) was nondialyzable, and the potency of the protein-containing lyophilized or glycerol-treated extracts was maintained well on prolonged storage." [See this *Bulletin*, 1957, v. 54, 752.]

HALSTEAD, B. W. **Dangerous Marine Animals.**

This book was reviewed on p. 679.

TOXOPLASMOSIS

HAVLÍK, O. & HÜBNER, J. Sérologický průkaz toxoplasmosy u některých domácích i volně žijících zvířat. [**Serological Demonstration of Toxoplasmosis in Some Domestic and Wild Animals**] *Československ. Epidemiol., Mikrobiol., Imunol.* Prague. 1958, v. 7, No. 6, 396–402. [30 refs.] English summary.

By means of the dye test a serological investigation of the incidence of toxoplasmosis has been carried out on 493 domestic animals, 304 wild animals and 127 birds living in various areas in Czechoslovakia. A positive result was obtained in 181 (37%) domestic animals, with the highest incidence in cats (78

of 86, 91%), dogs (27 of 86, 31%) and cattle (31 of 130, 24%), and in 42 (14%) wild animals, with the highest incidence in hares (23 of 81, 28%). The tests with the sera of the birds all gave negative results. *D. J. Bauer*

BUENTELLO, E. Comunicación preliminar sobre las relaciones entre toxoplasmosis, ácido lisérgico y esquizofrenia. [**Preliminary Observations on the Relationship between Toxoplasmosis, Lysergic Acid and Schizophrenia**] *Gac. Méd. de México.* 1958, Oct., v. 88, No. 10, 693–708, 1 diagram. [20 refs.]

The following is a translation of the author's summary:—

In 47 cases of neuropsychiatric conditions studied we have found positive serological and pharmacological reactions for *Toxoplasma* in 72·34% (34 of 47). When 5 cases of epilepsy were eliminated the remaining 42 were schizophrenic psychoses of various types and in them the percentage was 69·04% (29 of 42). We believe that this percentage is important in the understanding of the many investigations on the possible influence of *Toxoplasma* as a factor in the aetiology of schizophrenia.

If it is confirmed chemically that the substance produced by *Toxoplasma* is an alkaloid similar in action to d-lysergic acid diethylamide [this *Bulletin*, 1957, v. 54, 1359], the question arises whether the chronic effect of the intoxication can induce schizophrenic states either by itself or as a concomitant cause.

For the present, from the experiences described in this study, we incline to think that lysergic acid intoxication produces only schizomorphic states, differing from classical schizophrenia in the diagnostic features set out in the text and that these transient psychoses should be made the subject of a careful psychiatric study and research in Mexico.

The problem seems to be connected with the biochemistry of the cellular enzymes in general and not only with cerebral metabolism.

H. J. O'D. Burke-Gaffney

BEVERLEY, J. K. A. **A Rational Approach to the Treatment of Toxoplasmic Uveitis.** Reprinted from *Trans. Ophthalm. Soc.* 1958, v. 78, 109–21, figs. 40–47.

This paper is one of a collection of three read at the same meeting and is best read in conjunction with the other two and with special reference to the interesting discussion which followed, but which is not included in this reprint, of the experimental work involving non-immune rabbits and immune rabbits.

With regard to human uveitis, the author feels that the most usual mechanism is hyper-sensitivity to the cyst contents together with low grade proliferation. The drugs which have given the best results in treating experimental toxoplasmosis in animals are the sulphonamides, the diphenyl-sulphones and pyrimethamine. Further experimental work suggested that possibly the best therapeutic procedure is a combination of cortisone and one of these chemotherapeutic agents. This chemotherapy should be continued after the cortisone is stopped. *D. P. Choyce*

THIERMANN, Erica. Ensayo del "Lederkyn" solo y asociado a la "Primaquina" en la toxoplasmosis experimental del ratón. (Dos experimentos pilotos.) [**Treatment of Mouse Experimental Toxoplasmosis with "Lederkyn" alone and combined with "Primaquine"**] *Bol. Chileno de Parasit.* 1958, Oct.–Dec., v. 13, No. 4, 66–9.

The English summary appended to the paper is as follows:—

"The effectivity of 'Lederkyn' and 'Primaquine' alone, as well as in association, was investigated in two groups of experimentally infected mice with 20,000 toxoplasms.

"The following conclusions were drawn by comparing the survival time of the infected mice as well as the number of parasites found in the peritoneal exudate of these animals:

"a) 'Primaquine' shows low activity against toxoplasma infection under our experimental conditions;

"b) 'Lederkyn' at the dose of 4 mg daily seems to have a suppressive but no curative effect;

"c) 'Primaquine' associated to 'Lederkyn' reveals remarkable activity, inhibition of parasitic multiplication being evident. Very few toxoplasms were found in the peritoneal exudate of mice treated with both drugs and *T. gondii* could not be demonstrated—by animal inoculation—in mice killed 36 days after infection.

"d) No toxic effects were evidenced by the treated animals."

[Lederkyn is described as a sulpha methoxy pyridazine.]

DERMATOLOGY AND FUNGUS DISEASES

LOMBARDO, G. Episodio di "Yellowtail Moth Dermatitis" o dermatite da contatto su nave in arrivo al porto di Genova. [**Epidemics of Yellowtail Moth Dermatitis (Contact Dermatitis) in a Ship reaching Genoa Harbour**] *Ann. d. San. Pubblica.* Rome. 1959, Jan.–Feb., v. 20, No. 1, 131–6, 3 figs. [19 refs.]

The English summary appended to the paper is as follows:—

"An epidemic of dermatitis observed in a ship reaching Genoa harbour is described. The affection we are referring to is exceptional in our countries and its symptomatology could at first simulate smallpox. It resulted from contact with moths pertaining to genus Hylesia."

ZIPRKOWSKI, L., HOFSHI, E. & TAHORI, A. S. [**A Contribution to Caterpillar Dermatitis**] *Harefuah.* Jerusalem. 1959, Mar. 15, v. 56, No. 6 [in Hebrew 139–41], 8 figs. (5 on 2 pls.) English summary 141.

The English summary appended to the paper is as follows:—

"During October 1958 600 cases of caterpillar dermatitis occurred in a pine grove in Hulda. Rash and severe itching appeared after spending a few hours in the grove. *Thaumatopoea wilkinsoni* is the moth mainly responsible for caterpillar dermatitis in Israel. It is present in the Jerusalem Hills, Hulda,

Ramleh, and Holon. Adult forms appear in September, larvae in January and pupae in April. The last larval stages contain small poison hairs, which cause dermatitis.

"Experimental infestation on volunteers is described. It was shown that dead larva, cocoons and debris from infested pine trees cause the skin rash. The disease is not seasonal. Its appearance is not connected with hypersensitivity. Circumstantial evidence has been presented that the poison hairs of the insect causing this phenomenon contain a toxin."

TROPICAL OPHTHALMOLOGY

See also p. 868, Oomen, **Nutrition and some Disorders of the Eye in the Tropics.**

Ogura, K. [**Epidemiological Study of Trachoma in Kyoto City (A Survey on the Spread of Trachoma in the Slum Quarters)**] *Japanese J. Nation's Health.* 1959, Mar., v. 28, No. 1, 195–200. [12 refs.] [In Japanese.]

The English summary appended to the paper is as follows:—

"Although it has been reported in Japan that trachoma morbidity in cities is lower than in farming and fishing villages, the medical examinations of trachoma at 4 districts among the slum quarters in Kyoto City for 1952 showed a surprisingly high value, 45·2% on an average, in its morbidity. Among these areas, an observation of the morbidity at Mibu district, Nakagyoku Ward, yielded the results as follows.

"1) The morbidity was as high as 48·4%.

"2) The figure by sex was 47·2% for males and 49·3% for females. Any significant difference between the sexes was not recognized.

"3) According to the clinical examinations, the high value was recorded for heavy patients. Furthermore these patients were present at high rate among women as compared with men.

"4) By age, even infants also showed a high rate (37·2%).

"5) Many of infectious sources of the infantile trachoma were found in the mothers themselves.

"6) The occupations which indicated higher rates were commercial and industrial workers, day laborers, and shoe makers, which all were classified for the convenience of the present study.

"7) Patients with trachoma and conjunctivitis were of cumulative occurrence among the same families."

Pannarale, R. & Huet, M. Etude de la flore bactérienne conjonctivale des trachomateux par rapport à la présence d'inclusions. [**Study of Conjunctival Bacterial Flora in Trachomatous Subjects in Relation to Inclusion Bodies**] *Arch. Inst. Pasteur de Tunis.* 1959, Mar., v. 36, No. 1, 53–76. [41 refs.]

The authors studied the conjuctival bacterial flora during the winter in Tunisia in 108 trachomatous subjects. The bacterial flora in trachomatous

persons was compared with that in a group of 49 healthy subjects. They examined the form and number of inclusion bodies of trachoma and related them to the different types of associated bacteria. There was a high incidence of *Haemophilus* but the most florid forms of the virus (Halberstaedter-Prowazek bodies) were not met with more in association with *Haemophilus* than with other types of bacteria. In the inflammatory states of the conjunctiva caused by bacteria in trachomatous subjects (type of secretory trachoma) the intracellular inclusions were found more numerous than in patients without secondary infection.

The authors conclude that the presence in association of certain bacterial types does not constitute a factor activating the multiplication of the trachoma virus. The latter can be more often induced by a simple inflammatory state of bacterial origin independently of the type of micro-organism which has provoked it. *D. P. Choyce*

See also p. 880, BEVERLEY, **A Rational Approach to the Treatment of Toxoplasmic Uveitis.**

See also p. 865, RODGER, **The Movement of Microfilariae of *Onchocerca volvulus* in the Human Eye from Lid to Retina.**

HEAT STROKE AND ALLIED CONDITIONS

ELLIS, F. P. **Heat Illness.** *J. Roy. Nav. Med. Serv.* 1958, v. 44, No. 4, 236–48. [27 refs.]

Several general reviews of heat illness have been published recently [LADELL, this *Bulletin*, 1957, v. 54, 1242; THOMSON, *Med. Press*, 1958, v. 239, 100]. One article deals with this problem with particular reference to children (TROWELL and JELLIFFE, *Diseases of Children in the Subtropics and Tropics*, p. 822). [See below, p. 901.] The present work emphasizes those aspects of heat disorders of interest to the Royal Navy.

The suggested revised classification of heat illness [this *Bulletin*, 1959, v. 56, 96] is compared with the International Statistical Classification of the World Health Organization and with simpler classifications proposed by Ladell and by the author. The paper also includes discussion on the upper tolerable and acceptable heat stress limits, expressed in effective temperature, predicted 4-hour sweat rate, and wet-bulb-globe temperature indices.

There is a useful account of measures for the control of the thermal environment and prevention of heat casualties. *M. L. Thomson*

ELLIS, F. P. **The Atmospheric Environment between Decks.** *J. Roy. Nav. Med. Serv.* 1958, v. 44, No. 4, 249–60, 1 graph. [18 refs.]

This paper reviews the habitability of H.M. ships and the impact thereon of modern warfare, atomic, biological and chemical. The major change visualized from the conditions of the last war is the need to close ships down completely for what may be extended periods. This paper discusses the

quantity of fresh air required under these circumstances to dissipate heat, CO_2 and bacteria (probably not a serious factor) and to provide oxygen.

In schnorkel submarines intermittent changes in barometric pressure with mild anoxia occur when the air intake dips beneath the surface in rough seas. Traces of carbon monoxide from the engine exhaust may also enter this type of submarine. *M. L. Thomson*

MISCELLANEOUS DISEASES

GARDNER, A. F. **Experimental Lathyrism. Review of the Literature.** *Amer. J. Clin. Nutrition.* 1959, Mar.–Apr., v. 7, No. 2, 213–23, 2 figs. [52 refs.]

BARNES, H. D. **The Excretion of Porphyrins and Porphyrin Precursors by Bantu Cases of Porphyria.** *South African Med. J.* 1959, Mar. 28, v. 33, No. 13, 274–8, 1 diagram. [19 refs.]

"The excretion of porphyrins and porphyrin precursors by 15 adult Bantu patients with a cutaneous type of porphyria is reported and shown to differ from corresponding findings in patients with intermittent acute and variegate forms of porphyria.

"The implications of this observation in relation to the aetiology and classification of the porphyria in Bantu patients are discussed."

HIGGINSON, J. & SIMSON, I. **Lesions of the Gastro-Intestinal Tract in the Non-White Population of South Africa.** Reprinted from *Schweiz. Ztschr. f. Allgemeine Path. u. Bakt.* 1958, v. 21, No. 2, 577–81.

"If these differences in the frequency of peptic ulcer, appendicitis and diverticula are real and are not dependent on bias inherent in the study of necropsy material, these observations add support to the view that geographical pathology offers real hope in the prevention of these diseases. The tendency therefore for the disease pattern of the Eurafrican whose standards of living are usually higher than in the Bantu to approximate more closely to that of the white races assumes greater significance. It is doubtful if living conditions will alter sufficiently in the immediate future to permit the collection of better vital statistics, but the results so far available are of sufficient interest to indicate immediate support for careful proband investigations on cancer and other lesions of the gastro-intestinal tract."

KHAIRA, B. S., YOUNG, W. B. & HART, P. de V. **Melioidosis.** *Brit. Med. J.* 1959, Apr. 11, 949–52, 4 figs. on pl. [11 refs.]

"Melioidosis is an uncommon, but extremely serious, disease in man. Hitherto it has been almost entirely restricted to the inhabitants of south-east Asia, but in recent years cases have been reported in Great Britain, America, and south-east Africa among nationals who have returned from the Far East.

"Three cases recently seen in Malaya are described because they illustrate the success of appropriate treatment in a condition which is almost invariably fatal if unrecognized.

"The aetiology, pathology, clinical features, and treatment are briefly discussed."

PARASITOLOGY: GENERAL

WALTON, A. C. **Some Parasites and their Chromosomes.** *J. Parasitology.* 1959, Feb., v. 45, No. 1, 1–20. [33 refs.]

NITZULESCU, V., GEORGESCU, M., SIMIONESCU, O. & STEINBACH, M. Contributii la studiul eozinofiliei parazitare. [**Contributions to the Study of Eosinophilia during Parasitic Diseases**] *Microbiol., Parazitol. si Epidemiol.* Bucharest. 1958, May–June, v. 3, No. 3, 279–85, 6 figs. English summary (8 lines).

SHELDON, W. H. **Subclinical Pneumocystis Pneumonitis.** *J. Dis. Children.* Chicago. 1959, Mar., v. 97, No. 3, 287–97, 9 figs. [26 refs.]

"Pneumocystis carinii infection of the lung was encountered as an incidental autopsy finding in two white native American girls, one 3 months old, the other 10 years old. The morphologic lesions consisted of a slight focal interstitial pneumonitis which had produced no detectable clinical manifestations.

"These findings indicate that in this country pulmonary Pneumocystis infection may not be infrequent, particularly in subclinical form when it is associated only with mild and focal lung changes, and that it affects older children as well as infants. An appraisal of the available data suggests that in the normal host Pneumocystis carinii is of low virulence and that host resistance must be severely impaired before the parasite can proliferate sufficiently to produce clinically manifest disease."

[See this *Bulletin,* 1958, v. 55, 584.]

ENTOMOLOGY AND INSECTICIDES: GENERAL ZOOLOGY

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene and Toxicology.]

COLONIAL OFFICE. **Colonial Research 1957–1958. Colonial Pesticides Research Committee. Eleventh Annual Report (1957–1958)** [HALL, W. J., Chairman] (pp. 207–27). Cmnd. 591. 347 pp. 1958, Nov. London: H.M. Stationery Office. [14s. 6d.]

Progress in the control of a variety of insects is surveyed in this report. One problem in the control of the insects of medical importance is the effect of

the sprayed surface on the effectiveness of the insecticides used. Spray droplets have been found to penetrate below the fibres of unplaned Malayan wood, reducing the dosages available to mosquitoes at the surface. The activity of organophosphorus insecticides has been shown to be less when sprayed on porous materials and, on mud from Uganda, chlorthion was completely hydrolysed after 7 days. The incorporation of a wax into a gamma BHC dispersible powder improved the residual effect of the insecticide on plywood panels, but not on Uganda mud bricks. In Western Sokoto the sorption of building muds depends upon the surface area of the clay fraction. Successive dosage of DDT every half year increased the persistence of DDT on mud walls, possibly owing to superposition of dosages in the top half-millimetre at the surface.

Experiments in the field include measures against tsetse flies near Arusha in East Africa, involving a comparison of clearing methods and treatment of blocks of woodland with insecticide from the air. Aircraft have also been used against *Anopheles gambiae* around Dar-es-Salaam, and a 90% reduction in the adult mosquito population is reported after the application of a granular formation of dieldrin as a larvicide from the air. In south-west Uganda methods of controlling *Glossina morsitans* by residual spraying around the resting places are being compared. The cheapest method has been found to cost about 4 shillings per acre. In Northern Rhodesia 30% gamma BHC as a thermal aerosol from a light-weight TIFA produced a 99% mortality in the tsetse population, and this method combined with clearing has led to the virtual elimination of tsetse at Mwezia. BHC resistance in ticks is reported from Tanganyika, but no cases of resistance in *Anopheles gambiae* have been recorded from East Africa. Tests are being conducted in the West Indies on the effect of four organophosphorus insecticides on the larvae of DDT-resistant *Aëdes aegypti*. In England, studies are in progress on the relation of insect esterases and lipases to the action of chlorinated hydrocarbon and organophosphorus insecticides. Copper sulphate spray control of *Anopheles bellator* in the West Indies, research in the control of *Pistia* and *Eichornia* as well as other plants by herbicides, measures against *Aëdes polynesiensis* and *A. fijiensis*—the vectors of filariasis in Fiji, and laboratory studies on the olfactory responses of tsetse flies, are also reported. *B. R. Laurence*

MILLER, D. **Bibliography of New Zealand Entomology, 1775–1952 (with Annotations).** pp. xxiv + 492, frontispiece. 1956. Nelson: Cawthron Institute, New Zealand.

LOVE, G. J. & SMITH, W. W. **The Stratification of Mosquitoes.** *Mosquito News.* 1958, Dec., v. 18, No. 4, 279–83, 1 fig. [19 refs.]

In a two-year study in Georgia, U.S.A., the vertical distribution of 10 mosquito species was investigated by means of mechanical sweep nets. Catches were made at levels of 3, 6, 15, 25, 40 and 50 feet once weekly, no attractant being used.

Analysis of the catches of 85 nights showed that it was possible to group the species according to high catch rates for particular levels; thus *Anopheles crucians, A. quadrimaculatus* and *Uranotaenia sapphirina* all showed maximum recoveries at the 6 ft. level. Similarly *Aëdes infirmatus, Aëdes vexans* and

Psorophora ferox are grouped as showing a fairly uniform distribution with a preference for higher elevations. [Examination of the figures given in the table hardly seems to justify the authors' inclusion of *P. ferox* in this group, even allowing for their explanation of large catches at the 3 ft. level. In the case of *P. ferox*, if one disregards the 183 caught at 3 ft., the next largest catch was at 6 ft., while the differences between catches at the higher levels, $\bar{x} = 62{\cdot}5$, s 11·35, do not seem to be statistically significant.] *Culex restuans* and *C.* (*Melanoconion*) sp. appeared to fly at higher elevations than those of the first group while *Culiseta inornata* and *C. melanura* were evenly distributed, although the total catch for these species was only 96.

The significance of the findings may be correlated with feeding habits, the low fliers preferring man or animals while the higher fliers would be expected to feed on birds. The significance of this in connexion with an avian reservoir of a viral encephalitis is discussed. A note is made, however, to the effect that testing of 35 engorged specimens of *Aëdes vexans* showed that none had fed on birds. *E. R. Nye*

SURTEES, G. **The Genus *Uranotaenia* Lynch Arribalzaga 1891 (Diptera: Culicidae) in West Africa.** *West African Med. J.* 1959, Apr., v. 8 (n.s.), No. 2, 47–52. [29 refs.]

"There are seventeen West African species of the Genus *Uranotaenia* recorded up to the present time. The distribution and the general biology of these species is reviewed together with new data where available."

SERVICE, M. W. **The Morphology of some New Culicine Larvae from the Southern Cameroons, with Notes on *Culex* (*Culex*) *ingrami* Edwards and *Culex* (*Culex*) *toroensis* Edwards.** *Proc. Roy. Entom. Soc. of London.* Ser. B. 1959, Feb. 25, v. 28, Pts. 1/2, 1–6, 3 figs.

ANSARI, M. A. R. **A Report on the Culicine Mosquitoes in the Collection of the Department of Entomology and Parasitology (Inst. Hyg. & Preventive Med.), Lahore.** *Pakistan J. of Health.* 1958, Apr., v. 8, No. 1, 25–36.

8 species of *Aëdes*, one of *Armigeres*, 12 of *Culex*, and one species of *Theobaldia* are reported in recent collections in the city of Lahore. A table gives indications of breeding places and the seasonal and regional distribution of species; features helpful in their recognition supplement a key based on Barraud's earlier works. There are comments on culicines as vectors of pathogens. A list is given of 74 culicines and megarhines which may be expected to occur in West Pakistan. *D. S. Bertram*

WRIGHT, R. H. **A Theory of Olfaction and of the Action of Mosquito Repellents.** *Canadian Entomologist.* 1957, v. 89, No. 11, 518–28, 6 figs. [15 refs.] [Summary taken from *Rev. Applied Entom.* Ser. B. 1959, Apr., v. 47, Pt. 4, 52–3.]

To produce an odour sensation, a substance must be volatile and its molecules must come into contact with the olfactory end organ of the receiving organism.

There is evidence that the physical basis of odour is low-frequency molecular vibration [*RAE*, B, 1957, v. 45, 52], and a mechanism whereby such vibrations might be able to initiate discharges of the olfactory nerve is here discussed. It requires that the possession of an odour by a particular substance will depend on its having the necessary volatility together with a certain low-frequency mode or modes of molecular vibration, that the type of odour will depend on the particular frequency or combination of frequencies of the vibrational modes, and that the odour threshold concentration (minimum amount of material required to produce an odour sensation) will depend on the closeness of the coupling between the odorous molecules and pigment molecules in the olfactory end organ and on the closeness of the match between their natural frequencies of vibration.

The infra-red absorption curves in the range 700–400 cm.$^{-1}$ for 25 substances believed to be true olfactory repellents for mosquitos, 18 additional repellents whose mode of action is doubtful and 28 non-repellents are shown in figures. A striking correlation is demonstrated between repellency and a vibrational mode near 460 cm.$^{-1}$ [*cf. loc. cit.*]. The effects of water vapour, which is commonly regarded as an attractant for mosquitos but has a well-defined infra-red absorption maximum at 457 cm.$^{-1}$, are discussed, and evidence is cited from the literature to show that it becomes repellent to *Aëdes aegypti* (L.) at a sufficiently high concentration [*cf.* 1951, v. 39, 189]. If mosquito-repellent substances are adsorbed much more strongly on to the surface of the end organ than molecules of water, a small concentration of a repellent substance could be expected to produce a similar response to a very large concentration of water-vapour molecules, and repellent substances would owe their action to their ability to produce an illusion of high humidity and so evoke the avoiding reaction that high humidities produce.

COKER, W. Z. **The Inheritance of DDT Resistance in** *Aëdes aegypti*. *Ann. Trop. Med. & Parasit.* 1958, Dec., v. 52, No. 4, 443–55, 4 figs. [18 refs.]

By a simplified genetical technique, the inheritance of resistance in 3 strains of *Aëdes aegypti* [from Haiti (340 times resistant), Trinidad (120 times) and Malaya (6 times)] has been investigated. Crosses between the resistant strains and a susceptible colony indicate that in each case resistance is due to a single factor. The resistance of the F_1 is intermediate between the two parents and in the F_2 there is apparently a segregation into 3 genotypes; the regression line in this case presents a step-like appearance, the curve falling into 3 lines. Backcross data are also indicative of single factor inheritance.

When the resistant strains were crossed together the F_1 and F_2 regression lines were not significantly different, an indication that resistance in the Haiti and Trinidad strains was controlled by the same factor. The Malayan strain apparently owes its resistance to a different mechanism; in crosses with the Trinidad strain there was definite segregation in the F_2.

It is proposed that the difference in the resistance levels of the Haiti and Trinidad strains is due to a difference in the genetical background in which the resistance factor is located. *R. J. Wood*

BRANSBY-WILLIAMS, W. R. **Effect of Changes of Temperature on the Susceptibility to Dieldrin of Adult** *Aëdes aegypti*. *Bull. World Health Organization*. Geneva. 1959, v. 20, No. 1, 149–50.

Measurements of susceptibility levels of *Aëdes aegypti* to dieldrin had been made at Arusha, Tanganyika, at different seasons, by the Busvine/Nash method. In June an LC50 of 0·65% was obtained, while the figure for March–April was only 0·12%. It was considered possible that this might be due to the temperature difference, the monthly mean in March–April being 21°C. compared with 16·5°C. in June.

Accordingly, batches of *Aëdes aegypti* from the same laboratory colony were tested in two rooms kept at 18–19°C. and 24°C. After the one hour exposure period, they were returned to a recovery chamber, with a temperature of 15·5–19°C., and held for mortality counts the next day. The results from a series of concentrations gave an LC50 of 0·38% after exposure at 24°C. and 0·81% after exposure at 18–19°C. This proves that susceptibility to dieldrin in this test is lower at high temperatures [*cf.* DUPORT *et al.*, this *Bulletin*, 1959, v. 56, 593]. The difference was less than that observed between different times of year; this may be partly due to the fact that in the present experiments the holding temperature after exposure was the same for the two series. *J. R. Busvine*

LEA, A. O. & LUM, P. T. M. **Autogeny in** *Aedes taeniorhynchus* **(Wied.).** *J. Econom. Entom.* 1959, Apr., v. 52, No. 2, 356–7.

LAURENCE, B. R. **A Gynandromorph of** *Taeniorhynchus* (*Mansonioides*) *uniformis* **(Theobald) (Diptera: Culicidae).** *Proc. Roy. Entom. Soc. of London*. Ser. A. 1959, Apr. 15, v. 34, Pts. 1/3, 34–6, 4 figs. [13 refs.]

WOLFE, L. S. & PETERSON, D. G. **Black Flies (Diptera: Simuliidae) of the Forests of Quebec.** *Canadian J. Zool.* 1959, Apr., v. 37, No. 2, 137–59, 11 figs. (6 on pl.). [46 refs.]

PETRISCHEVA, P. A. & SAF'YANOVA, V. M. **[On the Problem of the Control of the Larvae of Black-Flies (Simuliidae)].** *Zool. Zh.* Moscow. 1956, v. 35, Pt. 12, 1849–52. [In Russian.] English summary, Suppl. pp. 9–10. [Summary taken from *Rev. Applied Entom.* Ser. B. 1959, Apr., v. 47, Pt. 4, 63.]

Experiments on the control of Simuliid larvae were carried out in the summer of 1955 in a river and several streams, and irrigation canals in the Vladimir district, in which 18 species were found breeding. The apparatus used, termed a hydroborer, consisted of a thin metal pipe about 2 yd. long, attached to a pump by means of a hose and having a nozzle at the end through which the insecticide was released at a pressure of 4–6 atmospheres below the surface of

the water, thus ensuring even distribution. The nozzle was directed, usually from the bank, towards the underwater parts of the vegetation on which the larvae and pupae were developing. Sections of a few yards were usually treated, but the effect extended for a considerable distance, as the insecticide was carried downstream by the current. The insecticides used were emulsion concentrates containing 16 per cent. BHC or 65 per cent. chlorten [chlorinated γ-pinene], which were diluted to 2 and 6·5 per cent., respectively, for use. Both proved very effective. In one larger test, in an irrigation canal about 2 yd. wide, some 1·5 gal. of the BHC concentrate was applied over a section about 100 yd. long. Complete control was achieved in a day down to the mouth of the canal, about 1,100 yd. away.

KETTLE, D. S., PARISH, R. H. & PARISH, Jean. **Further Observations on the Persistence of Larvicides against *Culicoides* and a Discussion on the Interpretation of Population Changes in the Untreated Plots.** *Bull. Entom. Res.* 1959, Mar., v. 50, Pt. 1, 63–80, 4 figs.

This is a report on the control by antilarval treatment of *Culicoides impunctatus* in bogland in Midlothian in Scotland three years after small experimental plots were sprayed with various concentrations of different insecticides [this *Bulletin*, 1957, v. 54, 96]. A preliminary part of the paper discusses natural fluctuations in larval numbers in untreated plots and this is allowed for in the assessment of control. The remarkable fact is that, after three years, DDT at 12, 50 and 200 mgm. per square foot (p,p'DDT) still gave 100% control, although at the lowest rate some plots were not completely controlled. Dieldrin at 12 and 25 mgm. per square foot and chlordane at 50 mgm. per square foot were also completely effective but not so at lower dosages. Gamma BHC was much less effective, only one out of seven treatments tested giving complete control. Except for BHC, success in control was not only apparent for three years after treatment, but appears to improve with time. The paper provides very full details of the work in the text itself and by tables and charts. *D. S. Bertram*

TAKAHASHI, S. **Notes on some Biting-Midges in the Niigata-Yamagata District (Ceratopogonidae, Diptera).** *Acta Med. et Biologica.* Niigata. 1958, Oct., v. 6, No. 2, 111–17, 6 figs.

SACCÀ, G. & RIVOSECCHI, L. Ricerche sulla speciazione nelle mosche domestiche.—V. L'areale di distribuzione delle subspecie di *Musca domestica* L. (Diptera, Muscidae). [**Speciation in the House-Fly. V. Geographic Distribution of the Subspecies of *Musca domestica* L. (Diptera, Muscidae)**] *Rendiconti Istituto Superiore di Sanità.* Rome. 1958, v. 21, Pt. 12, 1149–69, 9 figs. [16 refs.] English summary.

In this paper the authors describe further studies [see this *Bulletin*, 1957, v. 54, 503, 1371, 1372; 1958, v. 55, (108)] of the *Musca domestica* complex based on examination of some 1,900 specimens from many parts of the world, but

mainly from Africa. They have reached the conclusion that there are 3 important subspecies: *M. domestica* s. l.; *M. curviforceps*; and *M. cuthbertsoni*. In this scheme, *domestica* includes the 3 forms *domestica*, *vicina* and *nebulo*, which have been shown to intergrade [Saccà, this *Bulletin*, 1953, v. 50, 1088] and are now regarded as geographical forms of a cline. The three subspecies may be distinguished by the male frons/head width ratio, the form of the male paralobi and the posterior dorso-central bristles, thus:—

paralobi hooked ..... *curviforceps*
paralobi blunt ..... cline *domestica-nebulo cuthbertsoni*

post. d.c. bristles average 8, well developed ..... cline *domestica-nebulo curviforceps*
post. d.c. bristles average 10, anterior ones shortened ..... *cuthbertsoni*

frons/head ratio 0·04–0·06 ..... *cuthbertsoni*
„ „ „ 0·06–0·20 ..... *domestica-nebulo*
„ „ „ 0·10–0·18 ..... *curviforceps*

As regards distribution, the *domestica* cline is world wide; *cuthbertsoni* is African, and *curviforceps* occurs in Africa south of the Sahara. There is evidence of hybridization in several areas; *e.g.* of *domestica* (*vicina*)–*cuthbertsoni* in North Africa; of *cuthbertsoni-curviforceps* in West Africa; of *domestica* (*vicina*)-*curviforceps* in a few parts of East Africa. In spite of this possibility of hybridization, the subspecies exist in fairly pure form in many areas. *J. R. Busvine*

Saccà, G. Ricerche sulla speciazione nelle mosche domestiche—VI. Ibridismo naturale e ibridismo sperimentale fra le subspecie di *Musca domestica* L. [**Speciation in the House-Fly. VI. Natural and Experimental Hybridism between Subspecies of** *Musca domestica* **L.**] *Rendiconti Istituto Superiore di Sanità*. Rome. 1958, v. 21, Pt. 12, 1170–84, 4 figs. English summary.

Strains of flies showing characters of *Musca domestica*, *curviforceps* and *cuthbertsoni* can be reared for many generations in the laboratory. With the more representative strains, the characters remain more or less unaltered for up to 20 generations. With intermediate strains (presumably hybridized) there may be a gradual drift, *e.g.*, in the frons/head ratio.

Laboratory crossing experiments have been done with all combinations of the three subspecies, though some crosses are easier than others. Thus, male *cuthbertsoni* do not mate well with either of the other two; but reciprocal crosses are more successful. The cross between *domestica* and *curviforceps* is readily accomplised in either direction.

When crosses were made, the progeny showed hybrid vigour in higher proportions of pupae, greater proportions emerging and longer life. Experiments on the sexual isolation of the back-crosses indicated notable isolation of male *cuthbertsoni* mated to female hybrids.

Hybridization in nature was judged from the distribution of critical characters in samples of flies from various parts of Africa, which are described in some detail. It appears that slight to considerable degrees of hybridization occur in many areas. In some cases it appears to be transitory, possibly seasonal. The hybrids are quite vigorous and may interbreed with one of the parent strains, eventually becoming re-absorbed. It is not clear exactly how the subspecific identity is maintained in regions where the forms are sympatric; but the partial genetical isolation of the *cuthbertsoni* males must assist in regard to this subspecies. [See also Saccà and Benetti, this *Bulletin*, 1957, v. 54, 1251.] *J. R. Busvine*

Frontali, Nora. La sintesi di acetilcolina nella testa di mosca domestica. [**The Synthesis of Acetylcholine in the Head of the House-Fly**] *Rendiconti Istituto Superiore di Sanità*. Rome. 1959, v. 22, Pt. 1, 94–103, 4 figs. [19 refs.] English summary.

Rai, L. & Roan, C. C. **Interactions of Topically Applied Piperonyl Butoxide and Malathion in producing Lethal Action in House Flies.** *J. Econom. Entom.* 1959, Apr., v. 52, No. 2, 218–20, 1 fig.

"The nature of the antagonistic effects of piperonyl butoxide to the toxic action of malathion on house flies, *Musca domestica* L., was investigated. Malathion was topically applied to various sites on the house fly body with varying degrees of toxicity. The same phenomena occurred for the relative toxicity of malathion in combination with piperonyl butoxide.

"The antagonistic effects of piperonyl butoxide were demonstrated even when it was applied on a separate area of the integument, separate from the malathion treatment site, in nearly simultaneous topical applications to individual flies.

"The antagonistic effects of piperonyl butoxide decreased slowly over a 30-hour period, when it was applied first, followed at varying time intervals by the toxicant. In the reverse order of treatment such antagonistic effects decreased rapidly over a range of 30 minutes between the applications of malathion and piperonyl butoxide. The application of piperonyl butoxide 1 to 2 hours before malathion markedly increases the magnitude of the antagonism observed for simultaneous applications."

[See this *Bulletin*, 1956, v. 53, 1395.]

Siverly, R. E. **Effects of chilling of Pupae on Subsequent Emergence of Resistant and Susceptible House Flies.** *J. Econom. Entom.* 1958, Oct., v. 51, No. 5, 666–8, 2 figs.

Large batches of fly pupae from a DDT-resistant and a normal strain were put into a refrigerator at 40°F. (4·5°C.). Every day, for 5 days, three lots of 100 pupae of each strain were removed to a room at 85°F. (29·5°C.) and the adult flies subsequently emerging were sexed and counted. This whole procedure was repeated three times and the results were pooled.

It was found that chilling reduced the emergency from 70–80% down

to about 20%, in proportion to the length of exposure. There was substantially no difference in the effects of cold on the two strains except that the resistant strain had a lower emergence rate throughout and the difference was less evident when both strains were severely affected by chilling. It was noted that chilling prolonged the pupal period by an amount slightly greater than (× 1·1) the period spent in the refrigerator.

In the susceptible strain, about equal numbers of the two sexes emerged; but in the resistant strain females were always in the minority.

J. R. Busvine

Vostál, Z. & Horváth, J. Príspevok ku stanoveniu DDT-rezistencie u múch testom v Petriho miske. [**Determination of DDT Resistance in Flies by a Test in Petri Dishes**] *Československ. Hyg.* Prague. 1958, v. 3, No. 7, 416–20. [12 refs.] English summary (5 lines).

The authors have developed a method of assaying the resistance of flies to DDT. The bottom of a Petri dish is coated with a film containing a predetermined amount of DDT by evaporation of an acetone solution; 20 female flies are then enclosed in the dish and the numbers becoming paralysed are recorded at intervals of 1 minute. The assay is carried out in parallel with a standard strain of flies which are not resistant to DDT, and 5 replicates of the determination are set up. In each case the time required to produce 50% mortality (LT50) is determined, and the ratio between the LT50 for the test and the standard strains is taken as the resistance index. The assay was used in the determination of the resistance of the progeny of flies caught in 4 localities in Czechoslovakia where annual spraying with DDT had been carried out, and values of 1·46 to 4·00 were obtained for the resistance index.

D. J. Bauer

Wilson, H. G., LaBrecque, G. C., Gahan, J. B. & Smith, C. N. **Insecticide Resistance in Seven Orlando House Fly Colonies.** *J. Econom. Entom.* 1959, Apr., v. 52, No. 2, 308–10.

"House fly (*Musca domestica* L.) colonies were exposed to various insecticides in studies of the development of resistance. The No. 1 colony, in which experimental development of resistance to DDT was first demonstrated, is in the 270th generation and is maintained in cages coated with DDT: resistance is indicated to be greater than 500-fold. Selection in the LDD colony, now in the 164th generation, is maintained by constant exposure to treated panels. The colony shows 40-fold resistance to lindane, immunity to dieldrin, and 60- to 100-fold resistance to DDT. The C colony, exposed to 0·02% Dipterex in the diet, showed about 10-fold resistance when collected and developed no additional resistance in 98 generations of selection. The Bayer 21/199 colony developed greater than 90-fold resistance to this insecticide in 50 generations, the Grothe colony showed 52-fold resistance to malathion when collected and 100-fold resistance after 20 generations, the Tropical D colony showed 34-fold resistance to Diazinon when collected and 62-fold resistance after 20 generations, and the Tropical P colony showed greater than 18-fold resistance to parathion when collected and no increase in resistance after 20 generations; selection in these colonies was made with contact sprays."

BUSVINE, J. R. **Patterns of Insecticide Resistance to Organo-Phosphorus Compounds in Strains of Houseflies from Various Sources.** *Entomologia Exper. et Applicata.* Amsterdam. 1959, Mar., v. 2, No. 1, 58–67, 1 fig. [24 refs.]

To investigate whether resistance in house-flies (*Musca domestica*) to organic phosphate insecticides shows the same pattern wherever it occurs and whichever insecticide is the selecting agent, the resistance spectra of 4 strains of house-flies were worked out and compared with the spectrum shown in what is considered to be a homogeneous susceptible strain. The insecticides were topically applied in solution in olive oil to the thorax of the fly.

The four strains were:—

(1) DFP-resistant, selected in the laboratory in America by exposure of the adults to DFP [diisopropylfluorophosphonate] vapour;

(2) Danish resistant [this *Bulletin*, 1956, v. 53, 1394], selected in the field and in the laboratory by parathion;

(3) Italian resistant [*ibid.*, 1958, v. 55, 462], selected in the field and laboratory by Diazinon;

(4) American resistant [*ibid.*, 1959, v. 56, 109], selected in the field and laboratory by malathion.

14 organic phosphorus compounds were tested in all. The strains selected by parathion and Diazinon gave similar resistance patterns though the Italian strain selected by Diazinon usually showed higher degrees of resistance than the Danish strain selected by parathion. Both strains showed the highest resistance to parathion, paraoxon and Diazinon but low resistance to malathion. The American strain, on the other hand, showed a high resistance to malathion and low resistance to parathion, paraoxon and Diazinon. All 3 strains showed a similar order of resistance to chlorthion. The DFP strain showed only slightly increased tolerance to 10 of the compounds tested. The author suggests that this is a vigour tolerant strain.

A more detailed comparison of the two European strains showed that the Italian strain exhibits a higher degree of resistance to compounds with ethoxy groups, *e.g.*, diethyl 2: 2-dichloro-vinyl phosphate than to those with methoxy groups.

A comparison of degrees of tolerance of the normal and Italian strains when parathion and paraoxon are topically applied and when they are injected showed that the latter method produces a lower order, especially with paraoxon. A similar but less marked trend was also shown with parathion and the DFP strain. It is suggested that the loss of resistance to injected paraoxon is due to the excess of insecticide swamping the protective mechanism.

It is concluded from these observations that the two main patterns of resistance to organic phosphates shown in the European and American strains reflect different resistance mechanisms.

[The author, while stating that the colonies worked on are "rather highly selected, inbred populations approaching homogeneous resistance" admits that when maintained without exposure to insecticides some susceptible individuals appear. There is evidence that organic phosphate resistance is controlled by a single dominant gene and that selection will not therefore eliminate hybrids. Purity of strain could, however, surely be achieved by breeding from single flies and testing the F_2 generation for the absence of these susceptibles.]

G. Davidson

Saccà, G. La resistenza di *Musca domestica* L. agli esteri fosforici in provincia di Latina. [**The Resistance of *Musca domestica* L. against Phosphoric Esters in the Province of Latina**] *Rendiconti Istituto Superiore di Sanità.* Rome. 1959, v. 22, Pt. 1, 88–93.

The English summary appended to the paper is as follows:—

"After a 4 years period in which *Musca domestica* could be controlled in the province of Latina with organic phosphorus compounds and especially diazinon, resistance against this product appeared. The maximum resistance found in the field (expressed in LC50 in gr. of pure substance per sq.met.) reached values of about 60 times normal. A diazinon-resistant field strain was maintained during 10 generations at the original resistance level by submitting it in the laboratory to a moderate selection pressure."

Cherry, Lois M. **Fat Metabolism and Temperature Acclimatization in the Fly *Phormia terraenovae* R.-D.** *Entomologia Exper. et Applicata.* Amsterdam. 1959, Mar., v. 2, No. 1, 68–76. [17 refs.]

"When larvae of the fly *Phormia terraenovae* were fed on diets containing fats with different melting points and degrees of saturation, the fat laid down in the depots was affected though the range of the depot fats was much narrower than that of the fat in the diet. Larvae reared at high temperatures also laid down fat which had a higher melting point and a lower iodine number than did larvae reared at low temperatures.

"No relation between the properties of the fat and the thermal death point was discovered, though the temperature of rearing had an effect."

Parr, H. C. M. **Studies on *Stomoxys calcitrans* (L.) in Uganda, East Africa. I. A Method of rearing Large Numbers of *Stomoxys calcitrans*.** *Bull. Entom. Res.* 1959, Mar., v. 50, Pt. 1, 165–9.

Stomoxys calcitrans and *S. nigra* are the two species of this genus here recorded for Uganda, the former being more common. *Stomoxys* is suspected of mechanical transmission of cattle trypanosomiasis and certainly imposes inconvenient and disadvantageous grazing arrangements for cattle by its vicious biting habits.

Laboratory culture of *S. calcitrans* was begun as part of a study of this problem. Full detail is given of the technique developed. Adults, fed on 0·2% citrated bullock's blood, were kept in 2 ft. × 2 ft. × 2 ft. cages exposed to good sunlight; about 1,200 flies is a satisfactory number per cage. Egg-laying and larval development were successful in a medium of 9 oz. dried cow dung, 5 oz. dried blood granules and 1 oz. sugar, after a preliminary period of fermentation, about 200 larvae per 1 lb. Kilner jar of this medium being satisfactory. Larval rearing was at 90°F. and 90% relative humidity in an insectary, but adult cages were in ambient laboratory conditions.

The colony originated with 33 flies and for two years has maintained a strength of about 5,000 flies. *D. S. Bertram*

Pierquin, L. & Niemegeers, K. Répertoire et distribution géographique des tiques au Congo belge et au Ruanda-Urundi. **[Distribution of Ticks in the Belgian Congo and Ruanda-Urundi]** Reprinted from *Bull. Agric. Congo Belge*. 1957, v. 48, No. 5, 1177–224, 3 maps. [128 refs.]

As a preliminary to further studies on the ticks of the Belgian Congo and Ruanda-Urundi (an area to the north-east of Lake Tanganyika) the authors review the existing information on tick distribution. 61 species in 11 genera are listed, and details of locality, host species or where found, authorities and dates are given in tabular form. No original information is given but this appears to be a useful summary of the existing data and bibliography on ticks of this area. *E. R. Nye*

Pierquin, L. & Niemegeers, K. Tables dichotomiques pour l'identification des tiques adultes du Congo belge et Ruanda-Urundi. **[Tables for the Identification of Adult Ticks of the Belgian Congo and Ruanda-Urundi]** Reprinted from *Bull. Agric. Congo Belge*. 1958, v. 49, No. 2, 421–60, 6 folding pls. [31 refs.]

This is not intended to be an exhaustive work. It guides the general collector to the identification of his material to species, referring him to consult specialists in the group in difficult differentiations. The number of species reported in the several genera is given here in brackets: *Argas* (2), *Ornithodorus* (2), *Ixodes* (10), *Aponomma* (2), *Hyalomma* (2), *Amblyomma* (12), *Haemaphysalis* (4), *Dermacentor* (2), *Rhipicentor* (1), *Boophilus* (2), *Rhipicephalus* (22). There is a key to the genera and usually, to both males and females of the species, with supplementary descriptions which emphasize details depending on the difficulties speciation offers. Small, and rough, sketches illustrate the main parts of tick morphology in general and for selected species. *D. S. Bertram*

Floch, H. & Fauran, P. Ixodides de la Guyane et des Antilles Françaises. **[Ticks of Guiana and the French Antilles]** *Arch. Inst. Pasteur de la Guyane Française et de l'Inini. Publication No. 446*. 1958, May, 94 pp., 13 figs. [105 refs.]

See also p. 837, El-Ziady, **The Behaviour of *Ornithodoros erraticus* (Lucas, 1849), Small Form (Ixodoidea, Argasidae), towards certain Environmental Factors.**

Perry, A. S. & Buckner, Annette J. **Biochemical Investigations on DDT-Resistance in the Human Body Louse,** *Pediculus humanus humanus*. *Amer. J. Trop. Med. & Hyg.* 1958, Nov., v. 7, No. 6, 620–26, 1 fig. [21 refs.]

To determine some of the factors involved in the resistance of human body lice to DDT, experiments were performed on a Korean strain collected in the resistant state and maintained under DDT selection in the laboratory for several years [this *Bulletin*, 1952, v. 49, 565; 1953, v. 50, 579]. This was compared with a susceptible colony.

Topical application of DDT in acetone solution with a microloop indicated that the resistant lice could tolerate much larger amounts of DDT than the susceptibles with no apparent harmful effects. The amount necessary to kill susceptible lice was very small; both strains absorbed the insecticide very slowly and usually the amount absorbed in 24 hours was impossible to detect by the colorimetric method.

The feeding of lice through dissected chick skins on citrated human blood containing various concentrations of DDT confirmed that the resistant lice could tolerate much higher concentrations of the insecticide. The addition of an equal part of any one of 3 synergists (DMC, MR-60 or *p*-bromobenzenesulphonotoluidide) caused only a slight increase in mortality of resistant lice.

The chick-skin feeding technique was employed also in studying the metabolism of DDT *in vivo*. There was indication that the ingested DDT was metabolized by resistant lice into a relatively non-toxic polar substance insoluble in common organic solvents but partly extractable with methanol. "Determination of the metabolite by the Schechter-Haller method yielded a nitrated product which was removed from solution by dilute alkali, unlike DDT, DDE or DDA.

"Both susceptible and DDT-resistant lice metabolized DDT in vitro at approximately the same rate. The nontoxic, water-soluble metabolite gave a red-colored complex in the Schechter-Haller procedure and had solubility characteristics similar to that obtained in vivo.

"It appears that an intrinsic biochemical factor which, presumably, interferes with the detoxifying mechanism, might be operative in the susceptible strain. This interference is manifested in vivo but not in vitro." *R. J. Wood*

FURMAN, D. P. **Feeding Habits of Symbiotic Mesostigmatid Mites of Mammals in relation to Pathogen-Vector Potentials.** *Amer. J. Trop. Med. & Hyg.* 1959, Jan., v. 8, No. 1, 5–12. [12 refs.]

The ability of such ectoparasites as the tropical rat mite, *Ornithonyssus bacoti*, to pierce skin and suck blood is well understood, but it is less clear how and to what extent other mites—laelaptids and haemogamasids—do so. Mites of this kind have been suspected or shown to be vectors of Korean haemorrhagic fever (*Laelaps jettmari*), *Hepatozoon* spp. (*Echinolaelaps echidninus, Haemogamasus ambulans*) and tularaemia (*Laelaps muris, L. amphibius, H. glasgowi*).

A careful study of the blood-sucking powers of 7 mites is reported, *viz.*, *H. ambulans, H. liponyssoides, H. oudemansi, H. glasgowi, Brevisterna utahensis, E. echidninus*, and the dermanyssid *O. bacoti*. Only *H. liponyssoides* and *O. bacoti* fed readily on blood by piercing the intact skin of the host. They appear to be obligatory blood-suckers. The other species fed and reproduced on one or more diets of living and dead arthropods, dried or free fluid blood, or flea faeces. *H. glasgowi* and *H. ambulans* may also occasionally pierce skin to suck blood. Although piercing of unbroken skin was not observed for some of the species, they could obtain blood from pre-existing abrasions. Test mammalian hosts were *Peromyscus, Neotoma, Microtus*, laboratory mice and rats; lice, flea larvae and collembola were among the arthropods offered.

[This paper would be of particular interest to parasitologists and others

interested to keep laboratory cultures of these several mites found in the nests of rodents besides on the animals themselves.] *D. S. Bertram*

PRESS, J. M. **Measurement of Adsorption of Residual Insecticides using Flowing Chromatography.** *Bull. World Health Organization.* Geneva. 1959, v. 20, No. 1, 153–62, 3 figs.

Sorption of insecticide residues into mud walls plays an important part in determining their effective life in house-spraying campaigns [see, for example, BARLOW and HADAWAY, this *Bulletin*, 1959, v. 55, 674]. The present paper describes experiments to measure the sorptive power of 28 samples of soil from different parts of Africa. The method consists in allowing a known amount of insecticide dissolved in petrol ether (B.P. 55 to 58°C.) to flow through a column of the soil and determine chemically the amount remaining in solution afterwards. The amount sorbed can be expressed as a simple percentage or in terms of the molecular weight of the insecticide sorbed per gm. of soil ("Insecticide Adsorption Index"). Furthermore, the affinity of the compound for the soil can be further measured by the quantity of clean solvent required to wash it out from the soil subsequently.

The results show that dieldrin is more readily adsorbed than gamma BHC or DDT in soils but less adsorbed in alumina which had been used as a preliminary standard. [Presumably, then, artificial standard adsorbents will not give a reliable picture of happenings in mud walls.]

A comparison of the sorptive capacity of different soil samples with their chemical constitution suggests that sorption is favoured by high iron and aluminium content and low silicon content. There was also quite definite evidence that sorptive capacity was greater in samples of lower particle size.

J. R. Busvine

LICHTENSTEIN, E. P. & SCHULZ, K. R. **Breakdown of Lindane and Aldrin in Soils.** *J. Econom. Entom.* 1959, Feb., v. 52, No. 1, 118–24, 4 figs. [11 refs.]

"A muck soil, Miami silt loam and a sandy loam were treated in 1954 with lindane at rates of 10 and 100 pounds per 6-inch acre and aldrin at rates of 2, 20, and 200 pounds per 6-inch acre. Laboratory experiments were conducted, where a Miami silt loam was treated with either lindane or aldrin at a rate of 10 p.p.m.

"Lindane was found to break down within 2 weeks after application to a nontoxic compound, which was still detected by the colorimetric method for lindane, but not by bioassay. Two weeks after treatment the quantity estimated by bioassay amounted to 66% of that obtained by chemical analysis. Even after 3 years the same ratio was found between bioassay and chemical results. When field samples were analyzed, $3\frac{1}{2}$ years after treatment, the quantity estimated by bioassay amounted to 46% of that obtained by chemical analysis.

"Aldrin was found to be converted into dieldrin, which first was indicated by higher recoveries obtained by bioassay. Chemical analysis for dieldrin proved the presence of this insecticide in soils. It was found that relatively more dieldrin was formed in a sandy loam and in soils which had been treated at lower concentrations and which were held at higher temperatures.

" Experiments conducted in the laboratory showed that 2 weeks after treatment no dieldrin was formed in a loam having been held at 7°C. In soils, having been held at 26°C. or 46°C., 4 to 8% of the recovered insecticides were found to be dieldrin. The peak of dieldrin formation was reached 56 days after treatment, followed by a decrease."

LICHTENSTEIN, E. P. & SCHULZ, K. R. **Persistence of some Chlorinated Hydrocarbon Insecticides as influenced by Soil Types, Rate of Application and Temperature.** *J. Econom. Entom.* 1959, Feb., v. 52, No. 1, 124–31, 5 figs. [26 refs.]

" Field and laboratory experiments were conducted to determine the influence of soil type, rate of application, and temperature on the persistence of some chlorinated hydrocarbons in soils. Three and a half years after treatment 1·43 times more DDT, 4·25 times more aldrin and 8·45 times more lindane were recovered from a muck soil than from comparably treated Miami silt loam. A field plot (Miami silt loam) treated at a rate of 100 pounds per 6-inch acre contained—3½ years after treatment—2·03 times more DDT than the plot treated at a rate of 10 pounds per 6-inch acre. The comparable figure for lindane was found to be 3·50. Under laboratory conditions, figures comparable to field results were obtained when soils were incubated at 46°C. for a period of 56 days.

" Soil temperatures were found to be an important factor in the persistence of insecticides in soils. No insecticide loss was found in frozen soils. At a temperature of 6°C. aldrin and heptachlor (16% to 27%) were lost during a period of 56 days and only 2% to 14% of the initial insecticides were found after 56 days, when held at a temperature of 46°C."

MISCELLANEOUS PAPERS

ZUIDEMA, P. J. **Urgent Problems for the Practice of Medicine in the Tropics.** *Trop. & Geograph. Med.* Amsterdam. 1959, Mar., v. 11, No. 1, 24–31. [29 refs.]

" Every practitioner in tropical countries is confronted daily with the consequences of the low standard of living in tropical populations. The author illustrates this with a few examples. He stresses that the low standard of living around which many urgent problems present themselves, is a basic problem to the medical practitioner. Although the results of many eradication programmes are gratifying, a task of gigantic proportions remains: improvement of the prosperity and the standard of living of tropical population."

COLES, R. M. & DAVIES, J. N. P. **The Normal Heart Weight of Uganda Africans. Mulago Hospital Post-Mortem Studies—No. XII.** *East African Med. J.* 1959, Feb., v. 36, No. 2, 76–85, 1 fig. [22 refs.]

" Previous work dealing with the normal heart weight is reviewed. The view that the heart weight rises with age irrespective of body weight is not supported.

No racial differences have been established. The selection of suitable cases for analysis is discussed. The criteria by which 724 cases were selected from over 3,000 Mulago Hospital autopsies are described.

" In 456 adult males we found an average heart weight of 267 grams and in 130 females of 226 grams. These figures are far lower than those given by other authors. This discrepancy is reconciled by a consideration of the body weights. The heart weight of Uganda African males is 0·584% of the body weight and 0·555% of the body weight in African females. This is in accord with the figures of other workers. Some differences with other series are discussed.

" The normal African heart weight is directly proportional to body weight ranges of about 33–55 kg. Above and below these body weights, factors of emaciation and obesity may alter the relationship.

" The heart of the Uganda African is small because the Uganda African is a small person."

TANNER, R. E. S. **Sukuma Leachcraft. An Analysis of their Medical and Surgical System.** *East African Med. J.* 1959, Feb., v. 36, No. 2, 119–22.

The Sukuma are a large tribe (more than a million people) living on the dry cultivation steppe of north-west Tanganyika. Within a framework of ancestor worship and superstition " almost everyone knows and practises some sort of treatment for sickness. . . . Modern medical causation is widely understood, but to say that bacillary dysentery comes from drinking dirty water leaves untouched the reason for the patient having drunk from that particular pool of water ".

Diseases are classified on the basis of physical symptoms, but active medicaments form only part of the complete treatment which will often involve " expiation and propitiation ".

The pharmacopoeia of the Sukuma is extensive and may include some thousands of plants.

The author outlines some of the diseases recognized by the Sukuma, which he classifies according to whether they are named after symptoms, after something the symptoms resemble, after the infected part or after the cause. The vernacular name is given in each case.

Treatment is undertaken by (1) surgery or by mechanical devices, some of which may have been borrowed from Western medicine, (2) infusion, smoking or sniffing, (3) external application, or (4) swallowing. Examples of all these are given. The medicines used may be obtained from outside sources or more usually they may be indigenous, derived from animal, vegetable or mineral sources.

The remarkable data assembled by the author do not lend themselves to abstraction, but they give a very interesting picture of primitive medicine in which superstition and sophistication are intermingled.

H. J. O'D. Burke-Gaffney

REPORTS AND SURVEYS

BAILEY, K. V. **Health Problems in Indonesian Villages.** *Med. J. Australia.* 1958, July 26, v. 2, No. 4, 138–9.

This paper describes the medical organization in Indonesia and the problems encountered there. Most of the 1,500 doctors are concentrated in the towns, and the rural areas, containing some 80% of the people, have only a crude framework of a health service. The rural hospitals, staffed by one or two foreign doctors and several medical assistants (*mantris*), possess simple diagnostic laboratory facilities and the commonly used drugs are provided, though in inadequate quantity. Very few people from outlying villages attend hospital even when gravely ill; they are treated with traditional remedies by the " bush doctors ". In each area there are several polyclinics in charge of a *mantri* who may be responsible for 60,000 people.

The main medical problems are skin and eye diseases, intestinal worms, the dysenteries and, in some areas, malaria and yaws which are being attacked by centrally organized campaigns. Tuberculosis and typhoid are relatively common and nutritional standards are low. Staple foods are rice, cassava and maize, and vegetables and animal products are scarce and expensive. The average protein intake is about 1 gm. per kgm. of body weight, and vitamin A deficiency and kwashiorkor may be seen in any part of Indonesia. Malnutrition is partly attributable to traditional beliefs and partly to declining soil fertility resulting from population pressure.

The problem of poverty and ignorance is almost impossible to resolve. Health education could help, but few *mantris* are trained in public health education. Medical students also get little experience of village health problems. Trained midwives and their assistants in urban areas have done valuable propaganda during domiciliary midwifery and in the maternal and child health centres. Untrained village midwives are now being given practical training at these centres. Blind faith in injections as a remedy for all ills tends to hinder the patient's use of other forms of treatment and the provision of a balanced diet, and this attitude reacts on the doctor also. Village health projects are now being planned by the new division of rural health in the Health Ministry, but progress will depend on the level of education of the *mantris*.

T. H. Davey

BOOK REVIEWS

TROWELL, H. C. [O.B.E., M.D., F.R.C.P.] & JELLIFFE, D. B. [M.D., M.R.C.P., D.C.H., D.T.M. & H.]. **Diseases of Children in the Subtropics and Tropics.** pp. xvi + 919, numerous figs. 1958. London: Edward Arnold (Publishers) Ltd., 41, Maddox Street, W.1. [£5 5. 0.]

This is a beautifully produced book which has long been awaited by workers in tropical countries where diseases of children form such a large part of their work. It deals first in general terms with social and nutritional problems

and this is followed by a more orthodox description of the diseases and conditions found in tropical climes. The contributors—more than 70 in number—are drawn from all parts of the world and the editors have succeeded in assembling a well balanced and comprehensive volume of 41 chapters.

To readers in the United Kingdom it tells a fascinating story, and the section on breast feeding should be read by all paediatricians and obstetricians. The majority of diseases in the tropics are not bizarre clinical syndromes but conditions we know in Britain moulded and modified by local genetic, epidemiological, nutritional and living conditions.

At first glance its 900 pages seem a bit formidable but to those who miss the clinical description of disease in the modern textbook it is a refreshing and well written reminder of human pathology on a global scale. When we are told that " the majority of the world's children are born in the subtropics and tropics " we realize the justification and need for such a book, for it helps us to place the study of children and their diseases in its proper prospective.

This volume might well stimulate a young medical man to " chance his arm " on a career in the tropics in which he would find tremendous clinical adventure. It would be his good companion and " ever present help in trouble ".

A. G. Watkins

RODENWALDT, Ernst. **Tropenhygiene. Lebenshaltung und Lebensführung in warmen Ländern.** [Tropical Hygiene. Living Conditions in Warm Climates] 5th Edition. pp. ix + 179, 18 figs. 1957. Stuttgart: Ferdinand Enke.

The name of Ernst Rodenwaldt is well known to students of tropical medicine. In the early days of this century he lived for 4 years in Togoland and 12 in Java and Sumatra, where he undertook those fundamental studies on filariasis in which his name was linked with F. FÜLLEBORN and which are still to be read with profit. Now, as an octogenarian, he has been responsible for issuing the monumental World Atlas of Epidemic Diseases.

Though retired from University life he is still active, as the publication of the fifth edition of this book on tropical hygiene amply testifies. This is not to be regarded as a *magnum opus* on the science of hygiene in the tropics, replete with tables and statistics, but rather as a depository for reflections, sometimes whimsical, on the whole subject as it has affected the veteran pioneer. In laying down his conception of the laws of hygiene, he writes in a rather didactic style, relieved by shafts of humour here and there: there are passages, indeed, which assume an almost biblical fervour. The book abounds in good sense as we follow him in his disquisitions on the tropical climate in which we are introduced to the harmattan, monsoons and thunderstorms, and learn to juggle with isotherms.

His recommendations on fitness for the tropics follow the usually accepted and sensible lines. We must heartily agree with him that there are types of people which the tropics can well do without, especially epileptics, faddists and neurotics, and we must endorse his dictum that a sense of mission, of duty and self-discipline are essential for a successful career. The chief asset of the newcomer is ability to adapt himself to his surroundings.

He has something to say also about the role of European women and that

as much attention should be paid to their health as that of their male counterparts. They should be comrades and helpers, not ornaments. Their former inability to cope with their surroundings once led a Governor-General to remark that his married officials could only be assessed as "half-men".

He has something to say on preparation for life in the tropics and strongly recommends resochin (chloroquine) as the best prophylactic for malaria.

There follow sections on bungalows and housing for Europeans as well as for indigenous races, on food, clothing, water, drainage, sanitation, general hygiene and the conduct of health propaganda, and finally acclimatization. All are discussed in the same, calm philosophical vein. This is, in fact, a book of many interests. *Philip Manson-Bahr*

CLARKE, G. H. V. [M.A., M.B.B.S., A.R.I.C.] **Skin Diseases in the African.** pp. ix + 168, numerous illustrations. 1959. London: H. K. Lewis & Co. Ltd., P.O. Box 66, 136 Gower Street, W.C.1. [84s.]

In his introduction the author states that skin diseases account for about 16% of all diseases in the African, an incidence slightly greater than that met with in European countries. In contrast to dermatological practice in a European country it was found that the infective conditions accounted for more than half of all the cases seen in West Africa, whereas only 3·1% of patients were suffering from dermatitis and only 1·4% from eczema.

The first chapter deals with the physiology and histology of the African skin and the final chapters with fungus diseases and venereal infections. In the rest of the book skin conditions are grouped according to their relative commonness or rarity in either Europeans or Africans. While it is both interesting and important to know whether a condition is equally common in both races or practically confined to one, this does not make a good basis for classification. The arrangement is, in consequence, rather haphazard and there are a number of inaccuracies. Pemphigus neonatorum, for example, is listed among diseases common in both Africans and Europeans, whereas it has become extremely rare in most European countries. The chigger flea is described in a chapter devoted to conditions seen exclusively, or almost exclusively, in Africans, whereas it is, in fact, impartial to the colour of the toe.

Apart from the frontispiece, a coloured photograph of xanthism, the illustrations are in black and white. They are very profuse and most of them are of a high quality. The text has been compressed to relatively small parts of a little over 100 pages and does not provide much help in the management of skin conditions. It is, however, followed by a most useful and extensive bibliography.

This volume is useful not so much as a standard textbook but as an atlas in which are illustrated most of the skin conditions met with in West African patients. *H. T. H. Wilson*

SIMMONS, S. W. [Edited by.] **DDT. The Insecticide Dichlorodiphenyltrichloroethane and its Significance. Vol. II. Human and Veterinary Medicine.** 570 pp., 63 figs. 1959. Basle: Stuttgart: Birkhäuser Verlag. [Sw.fr. 66.–; DM 66.–.]

The first volume of this series was made up of five relatively short chapters by European authors, all but one of them writing in German (MÜLLER, P.

[Edited by.] *DDT. Das Insektizide DDT und seine Bedeutung.* 1955. Basle: Birkhäuser Verlag.). In contrast, this second volume, which is nearly double its size, has been written by three American scientists. Dr. W. J. HAYES, Jn., provides a long comprehensive review of the toxicity of DDT to man. Dr. S. W. SIMMONS (also acting as editor) has written a detailed survey of the use of DDT against arthropods of public health importance; and finally, Dr. E. F. KNIPLING has dealt with arthropod pests in veterinary practice.

Each of these articles provides a reliable summary of the early literature, but the first two virtually end in 1953 and the last quotes only references to 1952. This affects the value of the contributions to different degrees. Dr. Hayes's account would probably need little further revision to bring it up to date, as so much reliable work on safety limits of DDT was completed before 1953. Dr. Simmons's section is more affected by the delay in publication. The exclusion of more recent work and, in particular, the absence of comparison with newer insecticides, gives some of the sections more historical interest than value as an up-to-date appraisal. However, it is certainly a tribute to the universal applicability of DDT that so wide a survey could be attempted within eight years of general availability of DDT. The various disease vectors are considered on a geographical as well as a historical basis so that early usage in various parts of the world are summarized.

Dr. Knipling, dealing with pests of livestock, covers some of the same insects. The essential difference is the mode of application of insecticide and the varieties of livestock involved. Possibly the chapter might have been planned on this basis rather than on entomological grounds. However, the facts are there and he has been more inclined to include comparisons with other insecticides.

The value of this volume is certainly great and should repay the obvious amount of hard work, careful editing and excellent printing. Some sections, however, lend themselves more to monographic treatment than others. Thus, while the review of toxicology of DDT stands usefully alone, without need of comparisons with other poisons, the chapters on pest control on any one insecticide must seem artificially restricted. However, one supposes that it is the impetus from those specially interested in DDT that has made this series possible.

J. R. Busvine

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